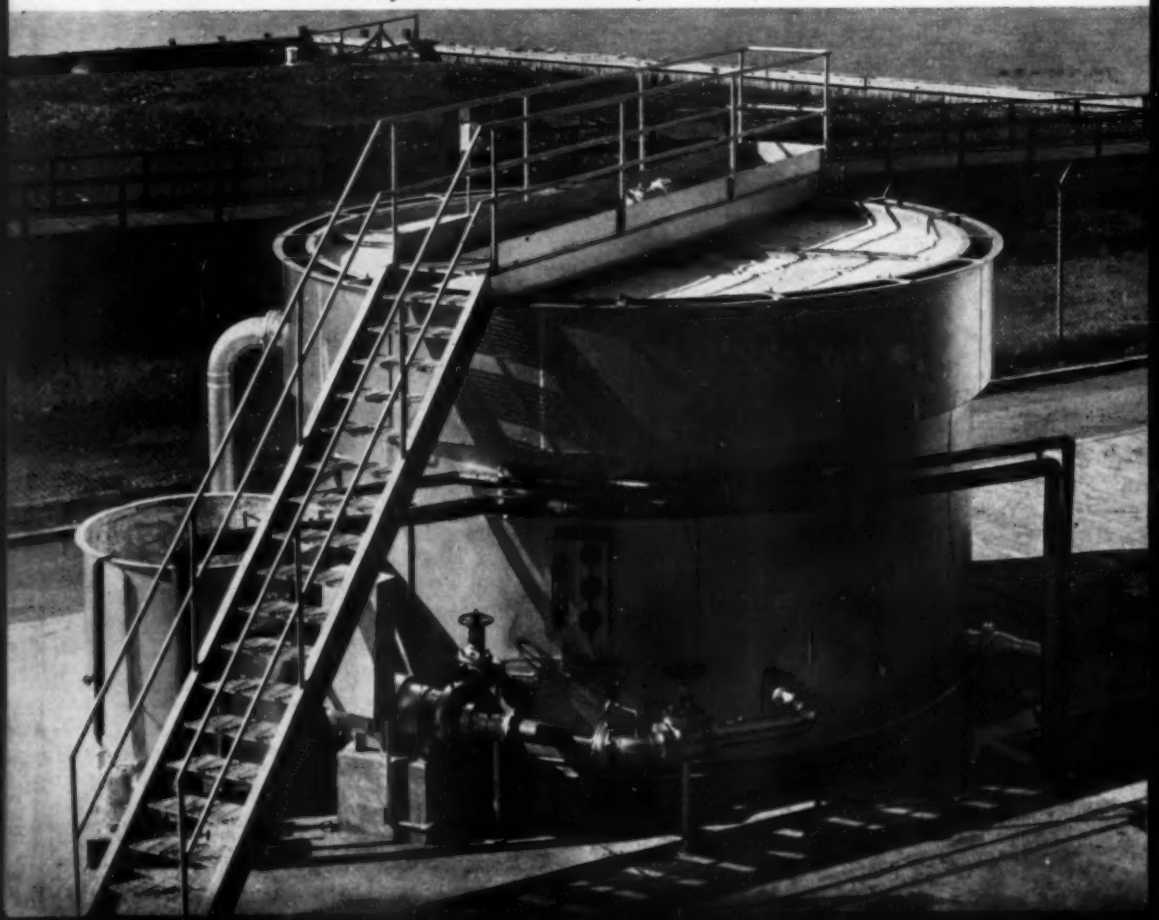
WATER & SEWAGE WORKS

WATER SUPPLY SEWAGE DISPOSAL

INDUSTRIAL WASTE TREATMENT

THE GIBBS UNIT
Providing Waste Treatment at the P&G Soap Plant at Quincy, Mass.



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MINIMUM WEAR!
REDUCED HEAD LOSS!

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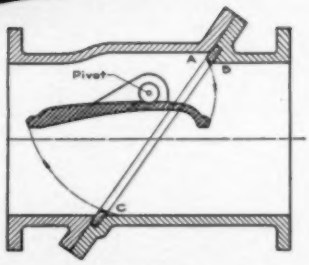
There's no slamming of the disc with Chapman Check Valves . . . no troubles with water hammer. And that means . . . no pipe line vibration, no danger of opening up joints. It's truly the valve with *cushioned closing.*

No wonder Chapman Tilting Disc Check Valves are noted for reducing maintenance cost. Noted, too, for effecting savings of from 65% to 80% in head losses over conventional type check valves. Why not write today for engineering data?



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

The Chapman Valve Mfg. Co.

INDIAN ORCHARD, MASS.

WATER AND SEWAGE WORKS. Reg. U. S. Patent Off. June, 1950. Volume 97. Number 6. Published monthly by Gillette Publishing Co., at 404 North Wesley Ave., Mount Morris, Ill. Per copy, 25c; Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as second class matter March 4, 1948, at the post office at Mount Morris, Illinois, under Act of March 3, 1879. Executive and business offices, 22 W. Maple St., Chicago 10, Illinois. Editorial office, 155 E. 44th St., New York 17, N.Y.

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PITTSBURGH EQUITABLE *Water Meters*

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This* ELECTRONICALLY CONTROLLED *TESTING PLANT in our water meter factory is the only one of its kind. It will handle up to 240 meters at a time on four test lines. In it, your orders for any of the domestic sizes of Pittsburgh Equitable meters (Arctic, Tropic or Empire) will be precisely tested for accuracy *to your specifications.* The control panels can be quickly adjusted to match the conditions that will be actually found in your system. For example, where specified, meters going into warm climates can be tested for accuracy and response at water temperatures of 100° F. or higher.

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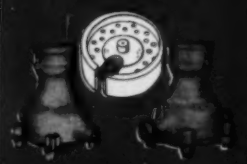

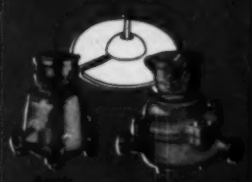

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WATER & SEWAGE WORKS

WATER SUPPLY—SEWAGE DISPOSAL—INDUSTRIAL WASTE TREATMENT

E. S. GILLETTE, Publisher

L. H. ENSLOW, Editor

COMING!

Water Treatment Developments

Is the story of developments in water treatment at Ottuma, Ia., since the history making venture in "Super-Super" chlorination was resorted to in 1940 as a "last ditch stand"in combatting a severe taste and odor condition. Since these experiences were reported in the April 1940 issue of "Water & Sewage Works" a new plant with a number of novel features has gone in at Ottumwa. The article describing these features, including triple chlorination, activated carbon contact beds, and other safe-guards against taste and odor occurrences is by the courageous and successful introducer of water chlorination in unheard of proportions in 1940—

HORACE A. BROWN,
Supt.-Eng'r. of Water, Ottumwa, Ia.

Painting Experiences at a Sewage Treatment Plant

The results of a study made of paints and painting practices most effective for preserving equipment and structures at a sewage treatment plant should prove of great value to all sewage works operators and engineers. These studies were made by, and are being reported upon by—

THOMAS T. HAY,
Sup't. Sewage Treatment, Racine, Wis.

Pumps and Pumping

Under the caption "What's Your H-Q?" the authors of a new series of short articles will discuss definitions in pumping, terms in evaluating heads, elements of composite pumping heads, and other items which are so important in specifying and selecting the right pump for the right job. From this series of articles much may be learned regarding the securing of overall economies in pump selection and pumping practices in general, wherein minor corrections may mean worthwhile reductions in day after day power costs. These simplified educational articles are by the well qualified team—

ROY CARTER and I. J. KARASSIK,
Hydraulic Engrs., The Worthington Pump Co.

Sewer Maintenance & Operation

Is the subject of a series of short pithy articles by an operator who is an advocate of "Special Tools for Special Work," as a safety and time saving economy measure. He is—

REUBEN F. BROWN, Supt.
Sewer Maint. & Operations, Los Angeles.

Water Treatment Experiences

A well qualified chemist and superintendent of water treatment with varied experience and keen observation sets forth some of his "Experiences in Water Treatment" in a series of articles, designed to be helpful to the less experienced and interesting to all. The author of this new series, which began in our January issue, is—

ALBERT H. ULLRICH, Supt.,
Water & Sewage Treatment, Austin, Tex.

Settling Tank Design

Is discussed by Prof. F. Popel of Stuttgart, Germany, in an illuminating article which appeared in "Gesundheits Ingenieur." We have asked C. E. Keeper, Deputy Sewerage Engr. of Baltimore, to prepare a translation of this important article for publication in an early issue. To this Prof. Popel is adding more recent disclosures than those appearing in the original article, plus a useful design nomograph.

Operation of Small Water Plants

Is a continuing series of articles by the same author of the popular series on the "Operation of Small Filter Plants" published previously. The next two articles of the series will deal with "Organization and Management" and "What About the Manager?" is the provocative title of the final article. The author is—

A. E. CLARK, Gen'l. Mg'r.
Nashville (Tenn.) Suburban Utility Distr.

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RICHMOND, VA.

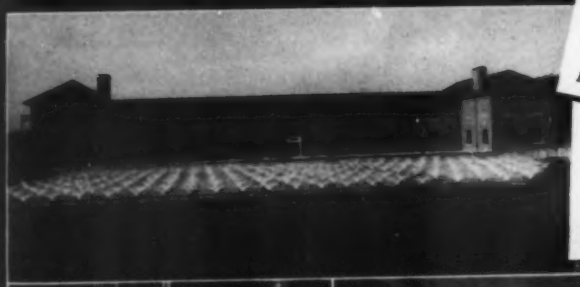
Filter Plant No. 2

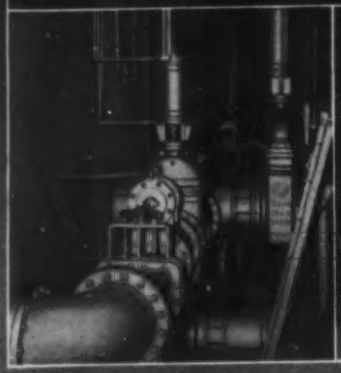
(COMPLETED IN 1950)

WHITMAN, REQUARDT, AND ASSOCIATES
Consulting Engineers
Baltimore, Md.

MARSDEN C. SMITH
Chief Water Engineer
Richmond, Va.

HOWARD E. LORDLEY
Asst. Dir. Public Utilities
Richmond, Va.





March 15, 1950 was a banner day in Richmond's history, marking the formal dedication of this modern twelve-bed filtration plant. Richmond's two basic water supply requirements — quality and quantity — are now fully satisfied. The new plant, operated in conjunction with existing facilities constructed in 1924, brings the city's water supply up to a rated capacity of 66 MGD — more than double its previous nominal rating.

To convert the James River water into an exceptionally fine water supply is indeed an outstanding accomplishment — a credit to the city engineers, the consulting engineers, and the contractor. The important functions of controlling and metering the flows through the plant are performed by Builders water works equipment installed by Bass Engineering & Construction Co. of Birmingham, Mich. Chronoflo Instruments electrically transmit information on flow and liquid level to conveniently located instrument panels. For complete information on Builders water works equipment, address Builders-Providence, Inc. (Division of Builders Iron Foundry), Providence 1, R. I.

Builders water works equipment furnished for the Richmond Filter Plant No. 2:

- **48" Venturi Tube with Chronoflo Electric Transmitter and Totalizer-Indicator for Raw Water**
- **36" Venturi Tube with Chronoflo Transmitter, Totalizer, and 24" Rate Indicator for wash water**
- **Chronoflo Transmitter and Totalizer-Indicator for existing Effluent Meter**
- **16" Filter Effluent Rate of Flow Controllers**
- **Loss of Head Indicators (vertical panel mounted)**
- **Rate of Flow Indicators (vertical panel mounted)**
- **Main Instrument Panel of enameled steel, with following Chronoflo Instruments:**
  - **Raw Water Totalizer-Indicator**
  - **Effluent Water Totalizer-Indicator**
  - **Raw Water Basin Level Indicator**
  - **Coagulation Basin Level Indicator**
  - **Aeration Basin Level Indicator-Recorder**
  - **Clear Well Level Indicator**

BUILDERS-PROVIDENCE
Instruments

"City highly endorses Badger Meters and Testing Machines"

That's what the mayor of one Illinois city wrote to another, adding: "Operation of these meters has always been satisfactory and maintenance-cost very reasonable . . . in our meter shop, a Badger Testing Machine enables us to see the quality of our work, which was not possible before we bought the Testing Unit."

In over 5000 communities, waterworks men know that "It pays to BUY BADGER".

Every waterworks superintendent should have the NEW BADGER CHART No. 689 (Practical Plan for Meter Storage Rack). WRITE today for this chart . . . no charge.

BADGER METER MFG. CO., MILWAUKEE 10, WIS.

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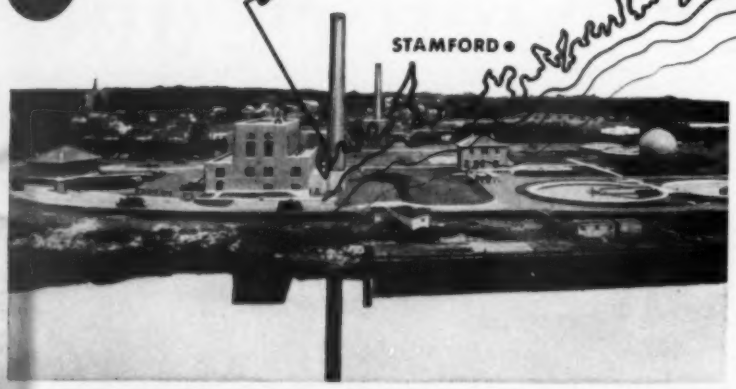
NEW YORK CITY • PHILADELPHIA • WORCESTER, MASS. SAVANNAH, GA. • CINCINNATI • CHICAGO • KANSAS CITY, MO. • WACO, TEXAS • SALT LAKE CITY, UTAH PORTLAND, ORE. • SEATTLE, WASH. • LOS ANGELES

You will find a Badger Meter size and type for every waterworks service. Shown here are Model SC-IOT (for warm climates), and Model A-IOT (for cold climates) . . . sizes ⅝" to 1¼" . . . other models in sizes up to 12". Write for complete information and prices.

BADGER Water METERS

ACCURACY • LOW-COST MAINTENANCE • DURABILITY • SENSITIVENESS

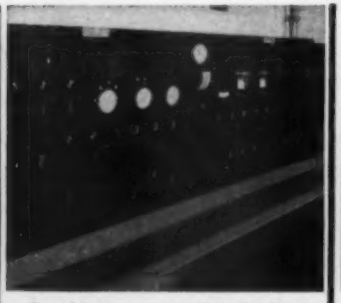
Stamford invests in



Sewage treatment and incineration are combined into one operating unit at Stamford, Conn. The plant uses the elutriation process to condition sludge. The effluent is post-chlorinated and sludge is flash dried for sale as a soil conditioner.

General Electric motors and control used throughout the plant keep running expenses low.

At this outdoor G-E unit substation, high voltage is dropped to utilization voltage for distribution to G-E motors and control throughout the plant. G-E standardized unit substations are completely factory-assembled, ready-to-install units.



One of the nerve centers of the Stamford plant, this G-E Cabinetrol control installation centralizes low-voltage control of motors, lighting, and other auxiliary equipment. Such installations conserve space and save steps; make for more efficient operation.

These G-E vertical motors drive centrifugal pumps which pick up sewage after it passes through bar screens. The control above the first motor automatically selects the pump or pumps needed to handle the flow. Five motors—one 20-hp, one 40-hp, and three 75-hp—are used.

GENERAL ELECTRIC

666-57

CLEAN WATERS

Modern G-E Equipped Combination Wastes Plant Economically Serves City of 70,000

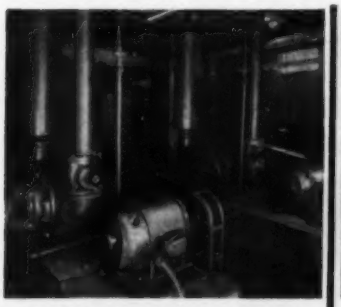
Before 1944, most of Stamford Connecticut's sewage had to run through its treatment plant quickly or by-pass it entirely. This created an unhealthful condition in Stamford Harbor and Long Island Sound. Today, *Stamford's waters are clean.*

Finding itself in the same situation as many other cities where the war brought increases in industrial activity and population, Stamford solved its sanitation problem by rebuilding its sewage treatment and incineration plants to combine them into one operating unit.

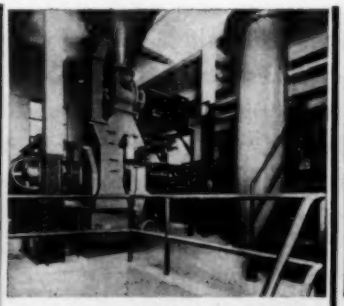
This investment in *clean waters* is returning large dividends in the form of better health, cleaner beaches, and higher community standing. What's more: the plant operator says the power cost of the new plant is less than the old one, thanks to modern processes and equipment recommended by the consulting engineer and General Electric.

General Electric can help your community get that new or improved sewage treatment plant by giving engineering assistance to help you and your consultant —*first* in helping formulate electrical plans and *second* in building public support with the full-color sound movie *Clean Waters*.

Contact your General Electric office early in the planning stage. The nearest G-E office is listed in your local classified 'phone directory. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*



The Tri-Clad motors shown above are V-belted to vacuum pumps used in the sludge dewatering process. Sludge is pumped from the elutriation tanks into vacuum filters for de-watering. Motors are 15 hp, 1800 rpm, and operate on 208-volts, 3-phase, 60-cycle a-c.



From the vacuum filter, sludge is conveyed from the sludge drying and weighing equipment. Drying and weighing equipment is at left, a dry divider at right rear. View shows one of several G-E motors used throughout the process.

Dry sludge is driven by means of screw feeders into garbage and refuse incinerators when required; normally, however, it is bagged and sold. Tri-Clad® special-purpose, open, gear-motors, mounted on the frame at upper right, chain-drive the conveyors.

GE SEWAGE-PLANT

SHOCK STRENGTH

Without shock strength—or, for that matter—without all of the strength factors listed opposite—no pipe laid 100 years ago in *city streets* would be in service today. But, in spite of the evolution of traffic from horse-drawn vehicles to heavy trucks and buses—and today's vast complexity of subway and underground utility services—cast iron gas and water mains, laid over a century ago, are serving in the streets of more than 30 cities in the United States and Canada.

Such service records prove that cast iron pipe combines all the strength factors of long life with ample margins of safety. No pipe that is provably deficient in any of these strength factors should ever be laid in city streets. Cast Iron Pipe Research Association, Thos. F. Wolfe, Engineer, 122 So. Michigan Ave., Chicago 3.

CAST IRON PIPE

Strength factors of Long Life !

No pipe that is provably deficient in any of these strength factors should ever be laid in city streets

SHOCK STRENGTH

The toughness of cast iron pipe which enables it to withstand impact and traffic shocks, as well as the hazards in handling, is demonstrated by the Impact Test. While under hydrostatic pressure and the heavy blows from a 50 pound hammer, standard 6-inch cast iron pipe does not crack until the hammer is dropped 6 times *on the same spot* from progressively increased heights of 6 inches.

CRUSHING STRENGTH

The ability of cast iron pipe to withstand external loads imposed by heavy fill and unusual traffic loads is proved by the Ring Compression Test. Standard 6-inch cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

BEAM STRENGTH

When cast iron pipe is subjected to beam stress caused by soil settlement, or disturbance of soil by other utilities, or resting on an obstruction, tests prove that standard 6-inch cast iron pipe in 10-foot span sustains a load of 15,000 lbs.

BURSTING STRENGTH

In full length bursting tests standard 6-inch cast iron pipe withstands more than 2500 lbs. per square inch internal hydrostatic pressure, which proves ample ability to resist water-hammer or unusual working pressures.

SERVES FOR CENTURIES

The Old Swimmin' Hole ~~ain't~~ is what it used to be!

IF James Whitcomb Riley could come back to his boyhood home at Greenfield, Indiana, today, he would find the beloved Old Swimmin' Hole once more what it used to be. Safeguarding Greenfield is a modern sewage treatment plant which includes the 128' dia. P.F.T. Rotary distributor shown above. H. T. Miller was the consulting engineer.

P.F.T. Rotary Distributors assure effective dosing of sewage to the filter media. Distribution is uniform with no dead zones and affording thorough percolation. Designed for all-weather, trouble-free service with minimum of maintenance. Literally thousands of P.F.T. units are in use—coast to coast.

NEW PFT SPREADER JET
For rotary distributors
Has readily removable orifice and deflector. Opening is designed to eliminate clogging.

OTHER PFT EQUIPMENT
Includes: Floating Covers, Gas Safety Equipment, Digester Heaters and Heat Exchangers, Sprinkling Filter Nozzles, Dosing Equipment, Siphons, Pre-Aerators, and Gages.

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SEWAGE TREATMENT EQUIPMENT EXCLUSIVELY SINCE 1893

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HORTON Welded Steel Reservoirs
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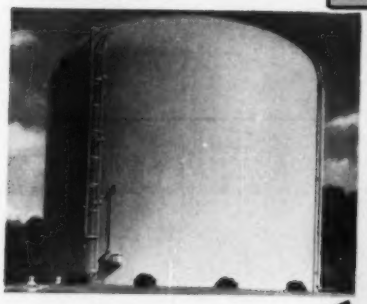
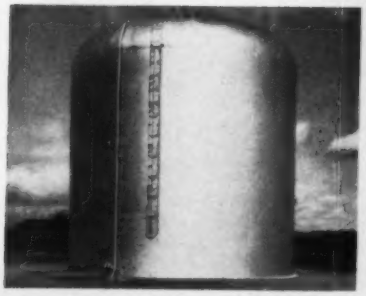
Elizabethtown

Ashland



Lansdale



All of the reservoirs shown at the left are 60 ft. in diameter, all are of butt-welded steel construction and all have ellipsoidal roofs—but there the similarity ends.

The following data shows that each of these similar-appearing tanks is designed especially for the needs of the community it serves and that each one is used to meet a different set of service conditions.

Elizabethtown—The Elizabethtown waterworks system serves the entire borough which has a population of 5,000 people. It supplies 1400 customers who use an average of 250,000 gpd. The reservoir has a capacity of 500,000 gallons and increases the total water storage in the system to 1,000,000 gallons.

Ashland—This 1,000,000-gal. reservoir helps maintain adequate service during peak periods in the low pressure area of the water distribution system. It is located at the western edge of Ashland's distribution system, and is filled from the mains during off-peak periods. During peak loads, water flows from the reservoir back into the mains to meet increased demands and maintain adequate water pressure in the low-pressure area. The Ashland system serves 2242 customers who use an average of 700,000 gpd.

Lansdale—The waterworks system at Lansdale serves the entire city which has a population of 10,000 people. It supplies 2727 customers who use an average of 688,000 gpd. The reservoir has a capacity of 1,250,000 gallons and increases the total water storage to 1,925,000 gals.

Horton ground-level reservoirs are widely used for storing large volumes of water because they are economical to construct and easy to maintain. Welded steel tanks do not crack and develop leaks even if there is uneven settlement. Their joints are *made* water-tight and *stay* that way.

Horton welded steel reservoirs are built in standard capacities up to 10,000,000 gallons. We will be glad to supply information or estimating figures on the cost of a reservoir—without any obligation, of course. Write our nearest office stating capacity required, location and diameter and height if special dimensions are required.

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Chicago 4.....2198 McCormick Building
Cleveland 15.....2262 Guildhall Building
Detroit 26.....1551 Lafayette Building
Houston 2.....2115 National Standard Building
Havana.....402 Abreu Building
Los Angeles 17.....1555 General Petroleum Building
New York 6.....3390—165 Broadway Building
Philadelphia 3.....1644—1700 Walnut Street Building
Salt Lake City 4.....550 West 17th South Street
San Francisco.....1283—22 Battery Street Building
Seattle 1.....1350 Henry Building
Tulsa 3.....1646 Hunt Building

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

G·A·G·A·G·A·

RICHMOND, VA.

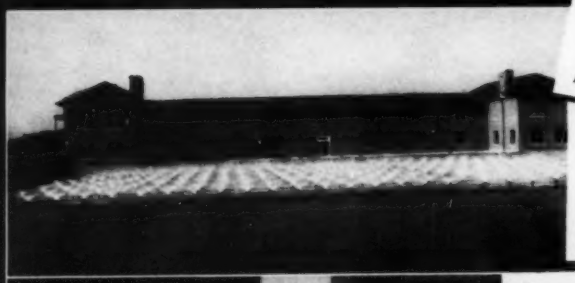
Filter Plant No. 2

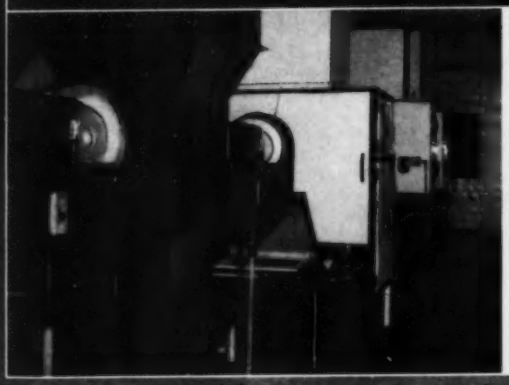
(COMPLETED IN 1950)

WHITMAN, REQUARDT, AND ASSOCIATES
Consulting Engineers
Baltimore, Md.

MARSDEN C. SMITH
Chief Water Engineer
Richmond, Va.

HOWARD E. LORDLEY
Asst. Dir. Public Utilities
Richmond, Va.





The history of Richmond's water supply dates back to the early nineteenth century, when untreated river water was first pumped into the homes of this city. March 15, 1950 marked the culmination of over 130 years of continuous advancement and improvement. With the dedication of this new twelve-bed filtration plant, Richmond can now boast of a water supply that's one of the most modern and efficient in the United States.

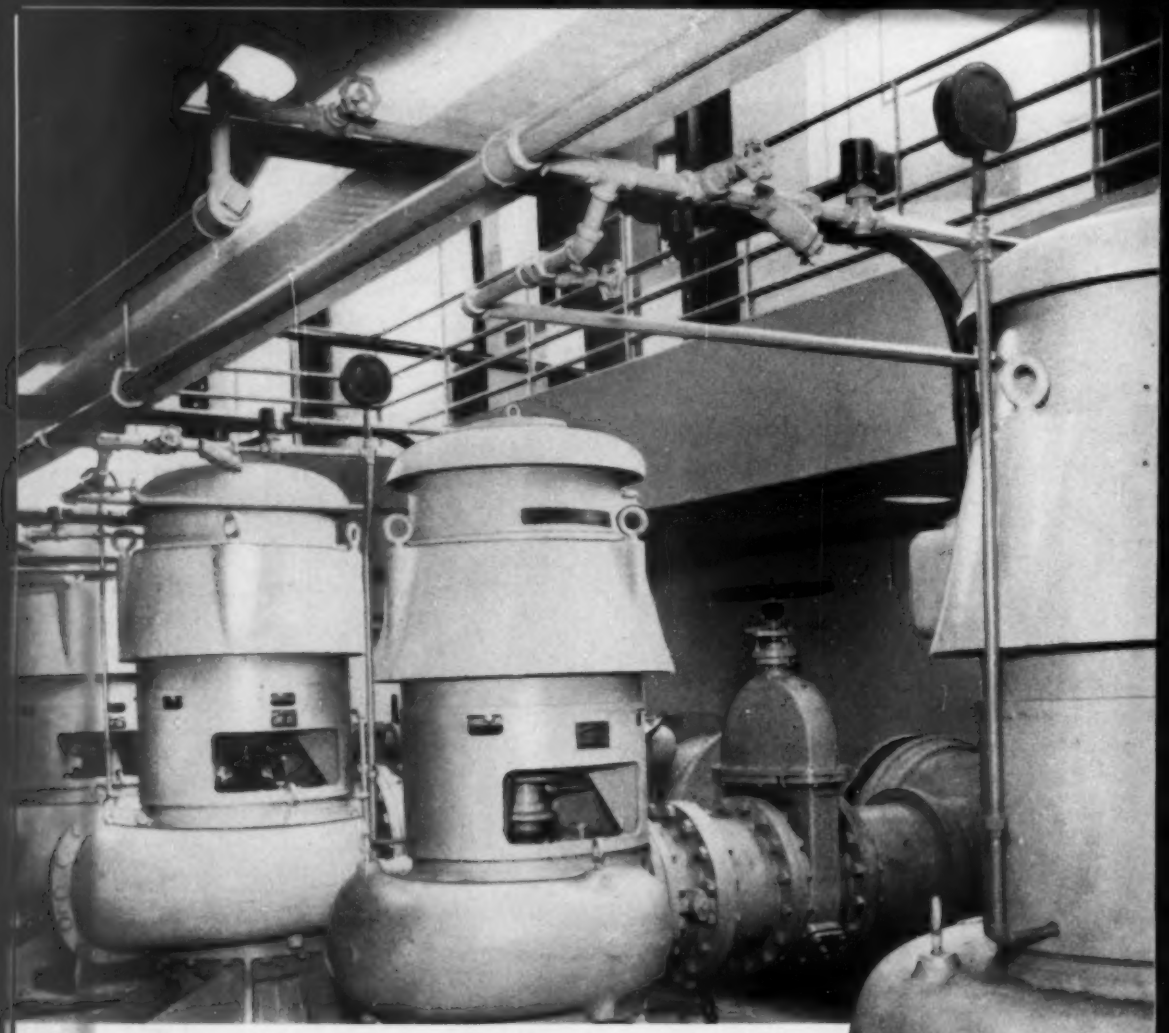
The problem of treating up to 66 MGD of James River water calls for the latest mechanical and chemical treatment methods. For this reason Omega Feeders were selected for the water purification process, supplying the correct amount of chemicals for coagulation and filtration, and for control of algae, taste, odor, and pH. These were installed by Bass Engineering & Construction Co., of Birmingham, Mich. For Bulletins describing Omega Feeders, address Omega Machine Company (Division of Builders Iron Foundry), Providence 1, R. I.

Omega equipment furnished for the Richmond Filter Plant No. 2:

- **2 — Rotolock Feeders for Carbon**
- **1 — Dust Collector**
- **1 — Disc Feeder for Copper Sulphate**
- **4 — Loss-in-Weight Gravimetric Feeders for Quick Lime**
- **4 — Lime Slakers**
- **2 — Loss-in-Weight Gravimetric Feeders for Alum**

THE LAST WORD IN FEEDERS

OMEGA



What's the Angle on Angleflow?

If you consider your pumping problems from the angle of big volume requirements—high overall plant efficiency—minimum maintenance costs—low to moderate heads—you're right down the Fairbanks-Morse Angleflow Pump alley!

These pumps not only meet these requirements—they beat them. Capacities ranging up to 100,000 G.P.M. . . . sizes from 8 to 54 inches assure a size and capacity for every job. Wide, unobstructed passages through impeller and volute mean these pumps can efficiently handle storm waters and screened sewage as well as basic water supply. They are adaptable for either wet or dry pit service. For complete details, see your Fairbanks-Morse Distributor, local branch office or write to Fairbanks, Morse & Co., Chicago 5, Illinois.

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DIESEL LOCOMOTIVES AND ENGINES
ELECTRICAL MACHINERY • PUMPS
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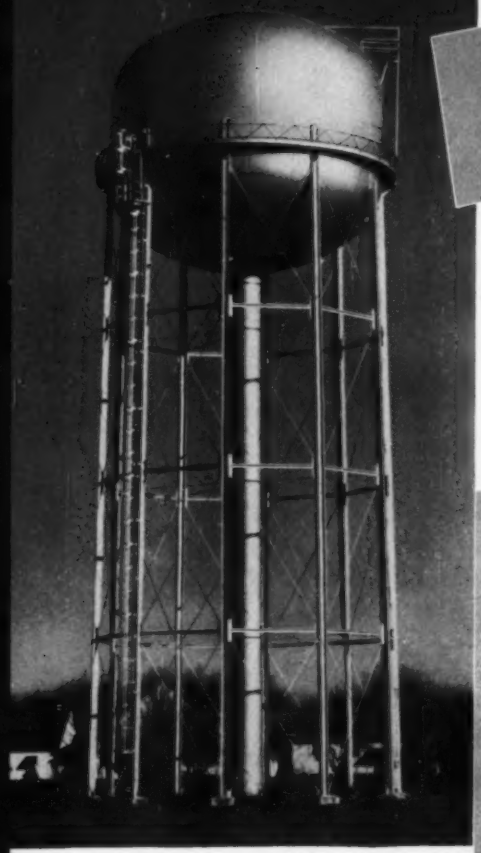
a name worth remembering



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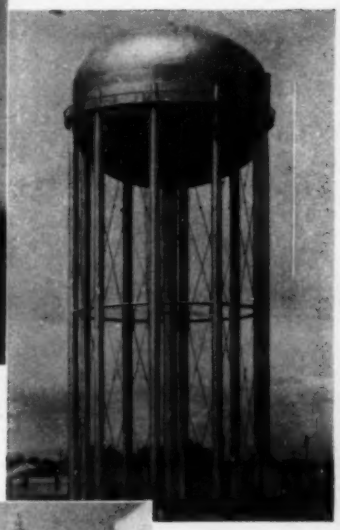
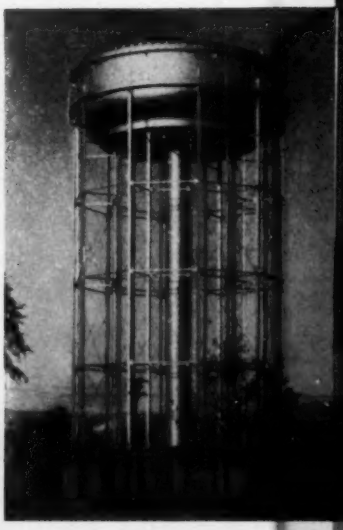
FOR EVERY NEED!

Elevated Steel Tanks

by PITTSBURGH • DES MOINES





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For all municipal water storage requirements, Pittsburgh-Des Moines Elevated Steel Tanks are supplied in a wide range of designs, and in capacities up to 2,500,000 gallons. ● Uniform pressures around the clock, supply during interruptions in pumping, lower pumping costs are but a few of the many reasons for this low-cost investment.

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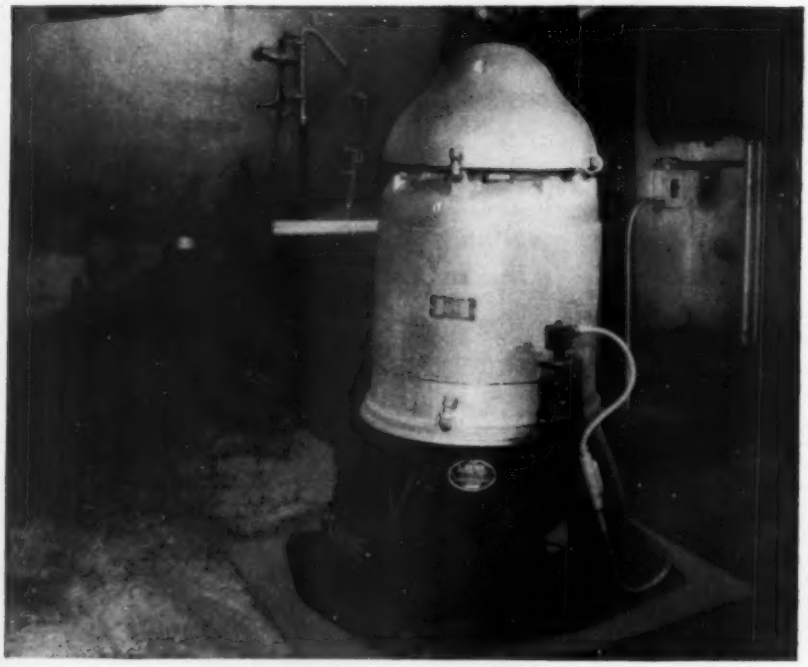
CHICAGO (3)	1222 First National Bank Bldg.	SEATTLE	926 Lane Street
	SANTA CLARA, CAL.	625 Alviso Road	



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Scoring on three important points;—scientific design, rugged construction and proper installation, Layne Well Water Systems are generously qualified for the heaviest production jobs on record. Furthermore, once installed, these systems keep right on providing good service for years and years. Records show that upkeep cost, in the majority of installations, is almost non-existent. All installations are exclusively by Layne Associated Companies whose engineers and field crews are widely experienced and thoroughly qualified. All contracts cover the job complete, including the final testing of the unit to assure Layne engineers and the buyer that the System is satisfactory in every way. For further information, catalogs, folders, bulletins etc., address

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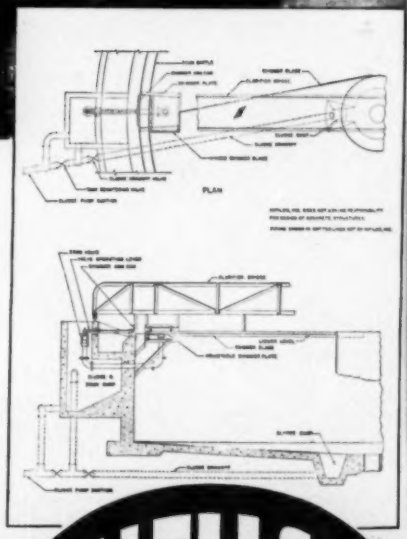
WELL WATER SYSTEMS

VERTICAL TURBINE PUMPS

ODESSA, TEXAS, INSTALLATION OF INFILCO AUTOMATIC HYDRAULIC SKIMMER



Controlled Currents Remove Scum this New and Better Way!

INFILCO'S Automatic Hydraulic Skimmer introduces a *new principle* in scum removal. Now, the use of *controlled currents* brings a new high degree of efficiency to the disposal of surface scum in primary clarifiers. The heart of the scum remover is the scum discharge pipe which fits into the center of the skimmer plate located just below the liquid surface. Here, controlled currents are set up to remove surface scum. Removal occurs automatically once during each revolution of the sludge scraper assembly.

WRITE TODAY for Bulletin No. S 6000. It gives all the interesting facts concerning this *better* scum remover. Also complete information about Infilco's "quiescent clarification" . . the ultimate in effective sedimentation and sludge removal.

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* BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1894 *

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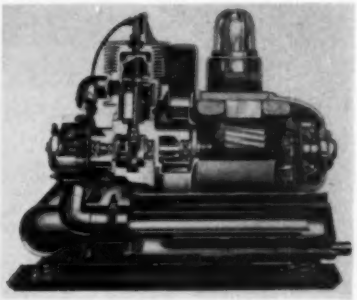
WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

You Need All Three...You Get All Three

1. PERFORMANCE, 2. DEPENDABILITY, 3. SERVICE

HOMELITE *Carryable* GENERATOR



1. Performance. True, a Homelite Gasoline-Engine-Driven Generator is light enough for one man to pick up and carry but its performance is big enough to operate any electric tools or brilliant floodlights for night work. In fact, it gives you power *plus* . . . power plus a large overload capacity . . . power that isn't sapped by long dangerous cables. Easy to get on the job; quick to start at all times, never bothered by extreme temperatures, a Homelite is always ready with electric power in any emergency. It will save time and money for you on all jobs. Ask for a free demonstration and see for yourself.

2. Dependability. For more than 25 years, Homelite engineers have specialized in building carryable gasoline-engine-driven units. Their experience in building close to three hundred thousand of these units has been responsible for the simplicity of design and precision construction with finest materials that insure long-haul dependability and lowest maintenance costs.

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STICK TO THE RULE OF THREE 1. Performance 2. Dependability 3. Service, and you'll always stick to a Homelite

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"Hydrocrane Cuts Our Travel and Set-up Time 95%"

WRITES A WATER DEPARTMENT SUPERINTENDENT

"We've reduced travel and set-up time by 95% over other equipment with our fast, truck-mounted Hydrocrane," writes W. J. Bleyle, Supt. of Water Dept., Tonawanda, New York. "This rig is a key unit in the maintenance of our water system.

"In the past 11 months we've dug up and replaced or moved 40 fire hydrants with the Hydrocrane. Usually the crane operator and two men handled the job — at times just the operator and one worker. With the Hydrocrane's precision hydraulic control, hydrants are eased into place quickly and without damage. We estimate savings at above $40 per installation.

"On one pipe job we set over 2,000 feet of 2-inch copper pipe. Here the Hydrocrane had a big edge over other equipment. It maneuvered easily under trees and wires and could be driven onto lawns and driveways without damage to them. We also laid over 300 feet of hydrant extension plus removing and replacing water mains with size ranges of from 4 to 16 inches. On repair work the Hydrocrane uncovered 26 water main leaks of various sizes. This used to be a tough, slow job with hand labor as wet dirt is heavy and sticky — now we handle the job in short order."

Two Hydrocrane sizes — 1/4 yard, 2-ton and 3/8 yard, 3-ton. Available with clamshell bucket, crane hook, magnet, catch basin bucket, snow bucket, 3-tine and multi-tine grapple. Send the coupon for full details.

Here the Town of Tonawanda's H-2 Hydrocrane unloads 18-foot sections of 6 and 8-inch water pipe. The crane unloaded over 2000 feet of pipe in 45 minutes.

BUCYRUS-ERIE HYDROCRANE DIVISION
SOUTH MILWAUKEE, WISCONSIN

I want the full story on the Hydrocrane.

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modernize—for greater capacity—economically with Rex Floctrol and Verti-Flo!

When increased demands exceed the capacity of your water treatment plant, you can bring your plant up-to-date . . . step up capacity . . . economically with **Rex Floctrols** and **Verti-Flo** Clarifiers. Installed in new or existing tanks, these efficient units provide greatly increased capacities . . . more effective results.

At the Fairmont, Minn., treatment plant for example, **Rex Floctrols,** installed in modernized tanks, and a **Verti-Flo** in an existing tank, made possible an increase in plant capacity from the originally designed capacity of 500,000 G.P.D. to 2,000,000 G.P.D. *without increasing the physical size of the plant.*

Tests show that the chemical reaction is complete within the Floctrol despite the extreme seasonal changes in water temperature.

The **Verti-Flo** equipment was installed in two existing rectangular settling tanks, providing for and efficiently handling 2,000,000 gallons daily, an increase of 1,500,000 gallons daily over the original designed capacity of the two conventional tanks. Detention time was reduced from 6.2 hours to 1½ hours, and solid removals were remarkably improved. Effluents were improved to the point where filter runs were increased 5 to 6 times.

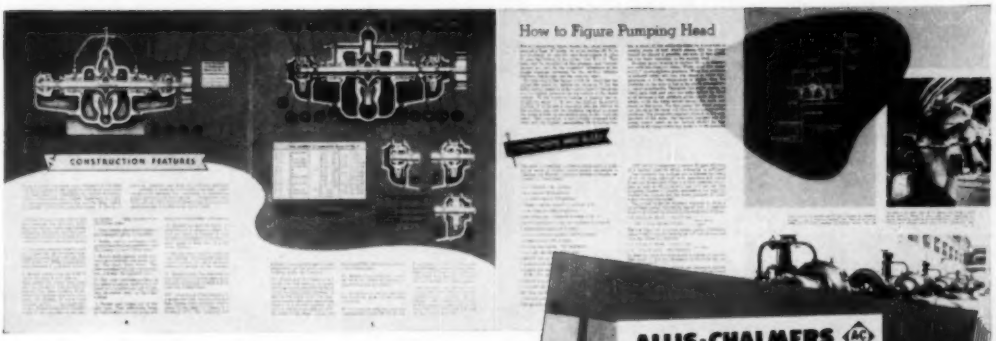
Why not reap the benefits of this modernization for your plant? For complete details and informative literature, write: **Chain Belt Company,** 1610 W. Bruce Street, Milwaukee 4, Wisconsin.

Rex Verti-Flo Clarifier at Fairmont, Minn.

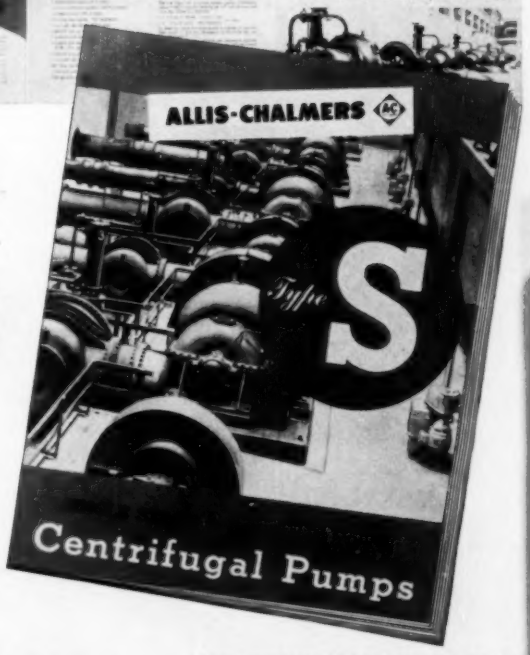
Rex Floctrols at Fairmont, Minn.

CHAIN BELT REX COMPANY

WATER TREATMENT EQUIPMENT



How to Select and Apply Pumps



New Bulletin Gives Facts On —

- **How to figure pumping heads**
- **Tables of pipe friction losses**
- **7 pages of Head-Capacity tables**
- **Detailed cross-section drawings**

TWENTY FOUR PAGES packed with the kind of engineering data that you'll want to keep for your files . . . and it's yours for the asking!

Contains: detailed cross-section drawings of the latest Allis-Chalmers pumps . . . seven solid pages of head-capacity tables covering hundreds of pump sizes . . . rules and constants plus instructions for figuring pumping heads . . . two full pages of tables showing friction losses for water per 100 ft of pipe . . . and pages more of important pump facts.

Buy "A-C" For Equipment Coordination

You can get a more complete package of equipment from Allis-Chalmers and *know* where responsibility lies. For example, A-C can furnish pump, motor and control together — in a single package!

If your community is planning *any* public works improvements, call in your nearest A-C Sales Representative.

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Please send me Bulletin 08B6146A, "Allis-Chalmers Type S, Single Stage, Double Suction Centrifugal Pumps."

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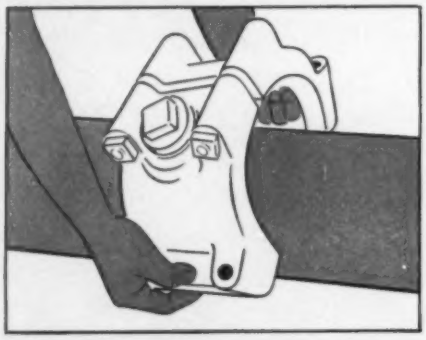
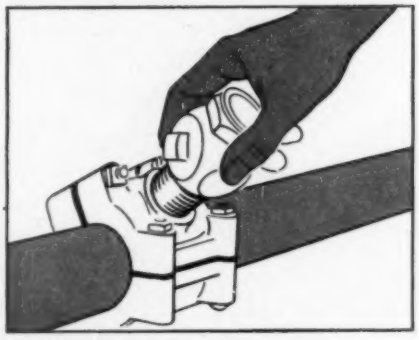
World's Widest Range of Public Works Equipment

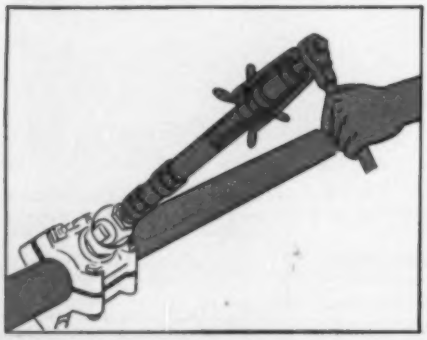
EASY WAY TO MAKE A 2" tap on a 4" main



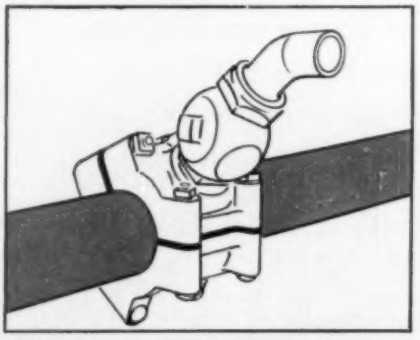
1. ***Fit Dresser Style 82 Sleeve on the pipe.*** This low-cost sleeve is easily installed, requires no caulking, is permanently bottle-tight.



2. ***Insert 2" corporation stop*** in the threaded vent of the sleeve. (Vented sleeve section furnished with corporation tap if specified.)



3. ***Drill pipe with tapping machine*** conventionally used for drilling through corporation stops.



4. ***Run Service*** according to your usual practice. Rubber packed sleeve assures lifetime flexibility at the main.

This method permits tapping a main under pressure, and is vastly simpler than siamesing several small taps together. It provides flexibility, eliminates the use of several corporation stops and requires only one drilling operation. Save time, save money—make all your larger taps with Dresser "Adjustable" Sleeves. *Write today for literature and prices.*

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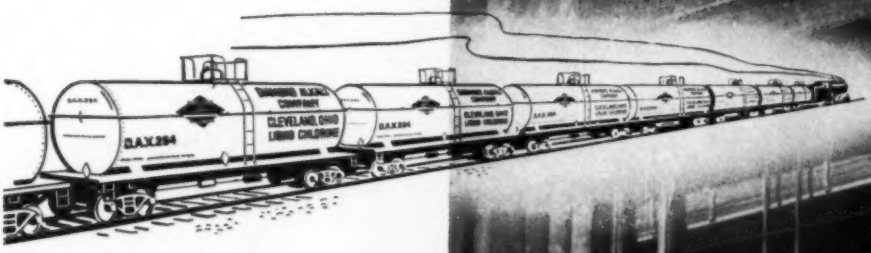

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If you are working on water purification projects—or if you anticipate that you may soon be—may we take part in your plans where chemicals are needed?

DIAMOND ALKALI Research Department has accumulated a fund of knowledge covering the handling, shipping, piping and application of chemicals in the field of water purification. Whether your work deals with sanitary disposal or purely industrial waste disposal, we shall be glad to work with you.

DIAMOND plants for Chlorine, Soda Ash, Alkali Specialties and Standard Silicates are excellently located across the country to assure good service. Get in touch with the nearest DIAMOND sales office regarding your present or probable needs.

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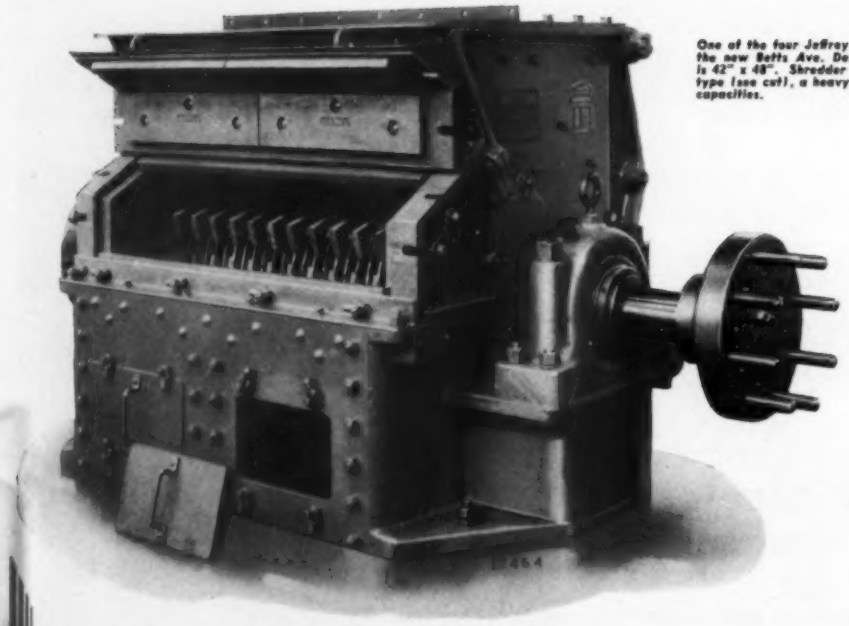

One of the four Jeffrey Shredders selected for the new Betts Ave. Destructor. Feed opening is 42" x 48". Shredder is of the swing hammer type (see cut), a heavy duty machine for large capacities.

JEFFREY SHREDDERS—STEEL APRON AND DRAG CONVEYORS SELECTED FOR NEW YORK CITY DESTRUCTORS

•

Equipment for water, sewage and industrial waste treatment plants:

Bar and Disc Type Screens
Screenings Grinders
Grit Washers and Collectors
Sludge Collectors
Sludge Elevators
FLOCTROLS
Scum Removers
Garbage Grinders
Chemical Feeders
Elevators and Conveyors
Chains and Sprockets
Equipment for Biofiltration Plants

To make the Betts Ave. Destructor the most modern of its type . . . to get the most efficiency in shredding and conveying, the design of this new plant includes: 4 Jeffrey Shredders; 8 Steel Apron Conveyors; and 8 Drag Conveyors. Here again "Jeffrey-Built" means Increased Capacity and Efficient Operation. Jeffrey engineers can help you in your modernization program . . . call upon them.

THE JEFFREY MANUFACTURING COMPANY Established 1877
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Complete Line of Material Handling, Processing and Mining Equipment

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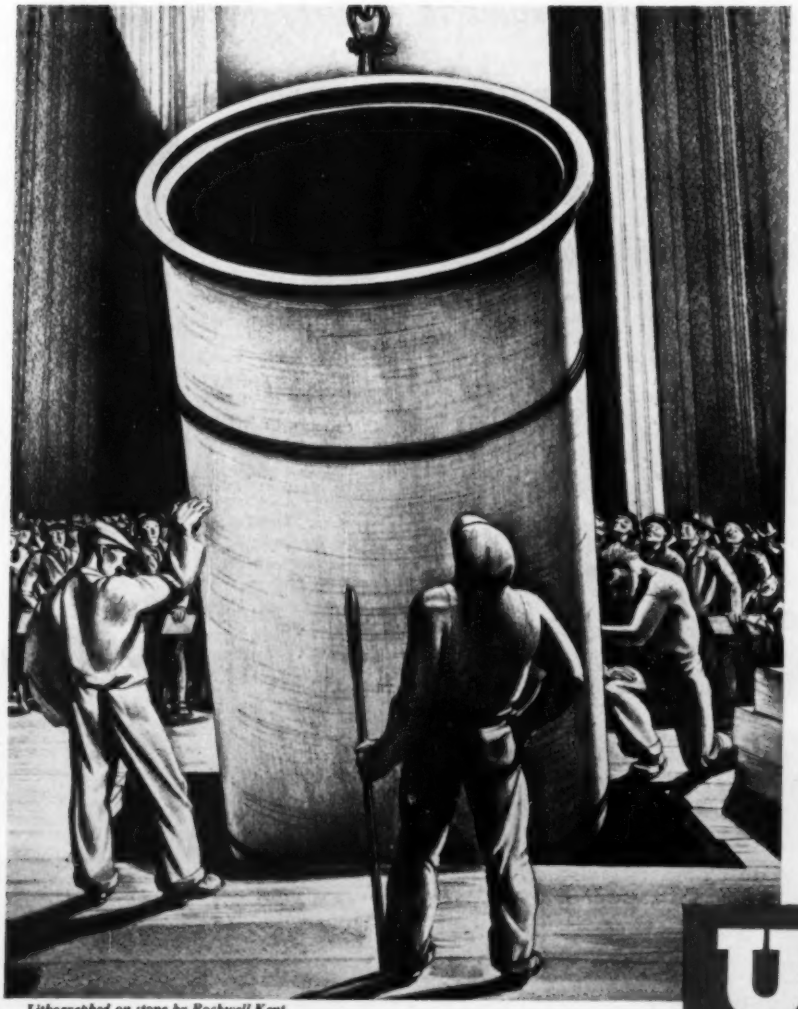

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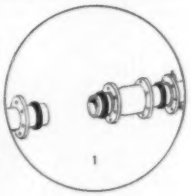
U.S. cast iron PIPE

FOR WATER AND SEWERAGE AND INDUSTRIAL SERVICE

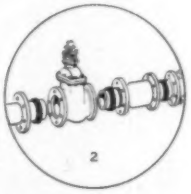
"Meet the customers' needs" has been our watchword for more than fifty years. Whether it's pipe seven feet, or a few inches, in diameter—or a complicated fitting—or a special casting—we have the equipment and the technical skills to meet almost any need for cast iron pressure pipe and fittings. Taking advantage of process developments and utilizing scientific methods to control quality, our plants are regularly manufacturing products that adequately meet our customers' exacting requirements. **United States Pipe and Foundry Company, General Offices: Burlington, N. J. Plants and Sales Offices Throughout U. S. A.**

If you have to install a valve in a hurry--with an eye toward economy....

...specify EDDY Cutting-in Valves and Sleeves

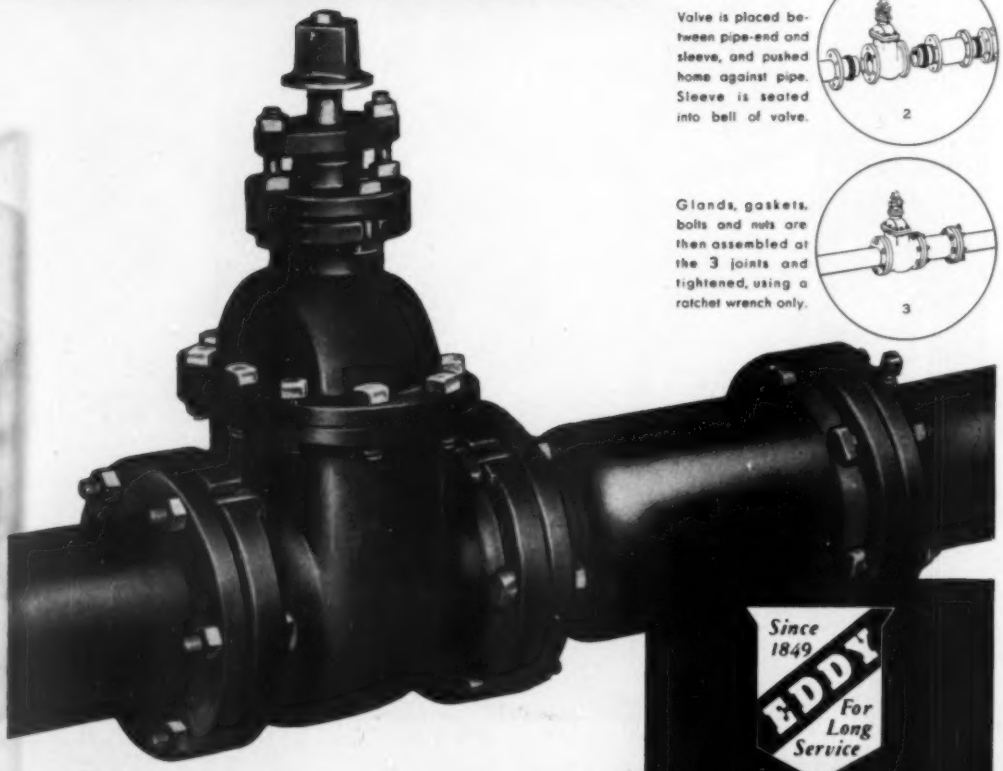


After excavation and removal of section of pipe, glands and gaskets are placed on pipe and sleeve. The sleeve is then pushed into position.



Valve is placed between pipe-end and sleeve, and pushed home against pipe. Sleeve is seated into bell of valve.

Glands, gaskets, bolts and nuts are then assembled at the 3 joints and tightened, using a ratchet wrench only.



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VALVE COMPANY
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Starting with step "1" above, two men with a ratchet wrench can install an Eddy Mechanical Joint Cutting-in Valve and Sleeve on an existing pipeline in less than 25 minutes. Every joint is bottle-tight under pressure, without caulking or lead-melting. Thus, the work can be done in any kind of weather, or in a flooded trench. Valves meet AWWA specifications; are available in 3 to 12" sizes for sand-cast and centrifugally-cast iron water pipe. Stock up now, for speedy installations.

GENERAL CHEMICAL "ALUM"

...Equally Efficient for Coagulation of WATER and SEWAGE!

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1. Produces crystal clear water.
2. Gives better floc formation.
3. Promotes better settling and longer filter runs.
4. Aids in reduction of tastes and odors.
5. Has no chlorine demand.
6. Is a *low cost* coagulant.
7. Superior in tests against other coagulants.
8. High in quality. Its constant uniformity can be depended upon.

FOR SEWAGE PLANTS

1. Clean, easy to handle.
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4. Clear, colorless effluents are possible.
5. Sludge digests readily.
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7. Chlorine consumption is cut due to lower demand of clarified sewage.
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Unmetered — Per capita consumption 100 gpd.
Metered — Per capita consumption 60 gpd.

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100% metered — Per capita consumption 116 gpd.

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Metering cut consumption 16%, postponed $250,000 expenditure for additional water supply.

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WATER & SEWAGE WORKS

Vol. 97, No. 6 June, 1950

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MODERNIZATION OF THE CORNELL UNIVERSITY FILTER PLANT

And Some Operating Results

by

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FOREST HOME, ITHACA, N. Y.

THE purpose of this paper is to give an account of the changes in operational procedure, and in physical structure, of the Cornell University Filter Plant that have occurred in the twelve years since the author assumed control. These changes reflect in most cases modern trends in water purification practice, and it is hoped that the results obtained may serve to encourage a more widespread adoption of modern devices and materials such as those dealt with here or their equivalent.

The present Cornell University Filter Plant started operation early in 1929. Water flows by gravity from a small diversion dam in Fall Creek to a grit chamber in the plant, then, in succession, through a flocculation basin, settling basins, filters and clear well to pumps which pump it to the storage reservoirs. In the original plant the coagulation basin was equipped with over-and-under and around-the-end baffles, the three settling basins were operated in parallel, and the three 500,000-gpd. filters were of conventional design with perforated pipe grid underdrains, graded gravel and sand. Provision was made for both pre-and postchlorination, and preammoniation was shortly added to provide a chloramine treatment of the raw water.

Superchlorination

The chloramine treatment eliminated coliform organisms satisfactorily but let through a considerable

The Author

number of gas-forming organisms giving false presumptive tests. In April 1939 the application point for the ammonia was changed to the filter effluent line while prechlorination was continued and the dosage gradually increased. The purpose was to obtain the speedier action of free chlorine during the time the water was flowing through the plant followed by conversion of the residual to chloramines after filtration. Results up to April 1942 were reported by Georgia[1] at which time the average prechlorination dose was 2.76 ppm. Such doses did not entirely eliminate false presumptive tests and doses have been increased until at present from 5 to 7-ppm. of chlorine is used.

With these higher doses an essentially sterile water is produced by the free chlorine, and if the ammonia dose applied to the filtered water is not too high chloramines are not formed, but rather a dechlorinating action is obtained. This action is, however, not easy to control, especially in cold weather, and it is hoped that the University may soon see fit to appropriate funds for dechlorination with sodium metabisulphite.

STRUCTURAL CHANGES

Basins

The three settling basins with a combined capacity of about 400,000 gal. were originally connected in parallel. The hydraulic gradients were such, however, as to produce short circuiting and skimming through one of them. By making a few simple changes the basins were connected in series with a marked improvement in the results obtained.

Filters

Prior to 1938 two of the three original filters had been rebuilt using the original design. The author found two of the filters in very bad shape and in need of rebuilding. In the first filter rebuilt a Wagner bottom was used, but this was later discarded in favor of a porous plate underdrain system.

When the second filter was rebuilt it was decided to use Norton porous plates, with Anthrafilt as the filter media and a Palmer Agitator for surface wash. The construction of this filter and some of the operating results obtained were described by Georgia[2]. Since then the two remaining old filters have been rebuilt along the same lines, and one new one has been added with essentially the same construction. Some changes in

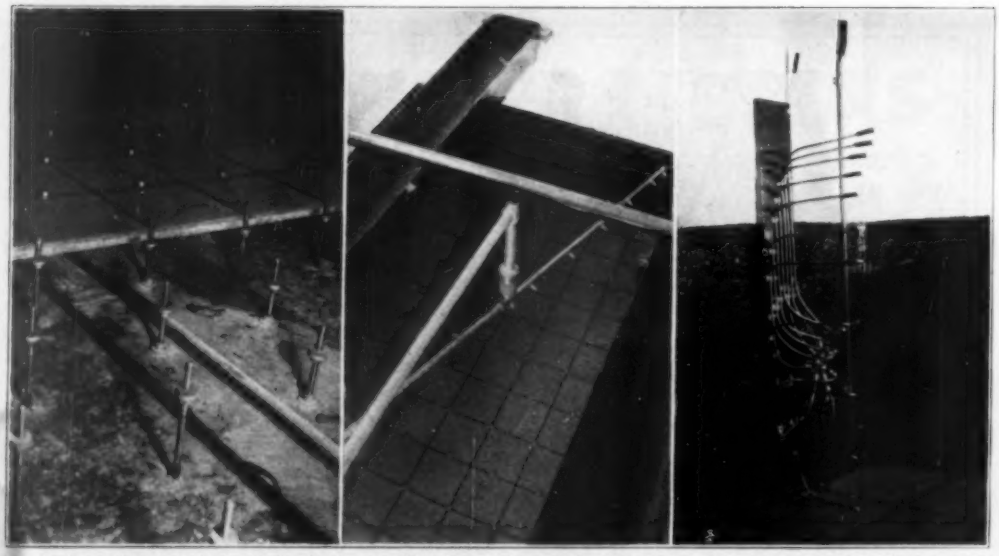

Fig. 1—Porous Plate Filter Bottom Under Construction. (Note three point anchoring with Everdur bolts and joint sealing of rabbeted plates.)
Fig. 2—Completed Bottom with Palmer Agitator in Place, Ready for Filling with Anthrafilt to within 2-in. of the Revolving Agitator Arm.
Fig. 3—No. 1 Filter Equipped with Piezometer Tubes for Observation of Distribution of Head Losses Through Filter Bed and Porous Plate Bottom

specifications and materials have been made, however, as a result of our experience, and it may not be amiss to describe the construction of the filter and to bring the record up to date.

The filters are all 12 x 15 ft. and are rated at 500,000 gpd, but are provided with rate controllers permitting operation up to 750,000 gpd. A square concrete channel runs the length of each filter at the center line and below the bottom. Fifteen 2¼-in. holes spaced on 12-in. centers connect this channel to the filter and serve both as the outlet for filtered water and the inlet for wash water. A metal plate 18-in. wide and running the length of the filter is held on studs 2-in. above these holes. The purpose of the plate is to break up the velocity head of the wash water entering the filter and thus give better wash water distribution. In the first filter this plate was made of 3/16-in. steel coated with Bitumastic enamel. Since this metal plate is located below the porous plates, and cannot be repainted, plates of Herculoy (silicon bronze) alloy ⅛-in. thick were used in all other filters.

Everdur (silicon bronze) anchor bolts or studs were used to support the porous plates. The bolts were spaced by a template, such as is shown in Fig. 4, while a 4-in. reinforced concrete slab was poured to hold them in place. The 15 holes in the center manifold, above mentioned, extend through this slab of course. Great care was required to obtain proper spacing of the Everdur studs. A three point method of support for the porous plates, due to T. R. Camp, was used and is shown in Fig. 1. The three point support prevents placing the plates under strain when nuts are run down. Fig. 1 also shows the metal baffle plate described above and part of the Everdur piping system by means of which acid or chlorine-water may be introduced under the porous plates if ever necessary for cleaning purposes. Fig. 2 shows the completed bottom and the Palmer Agitator in place.

The Porous Plates

Plates of proper porosity are produced by the manufacturer by mixing properly sized granules of aluminum oxide with a ceramic bonding material, molding and then firing. During the firing some expansion takes place so it is impossible to make plates to exact dimensions. Plates can be made to close tolerances, however, by making them slightly oversize and then grinding them to size. If plates are oversize it is impossible to fit them in the space available and we, therefore, now specify that plates shall be

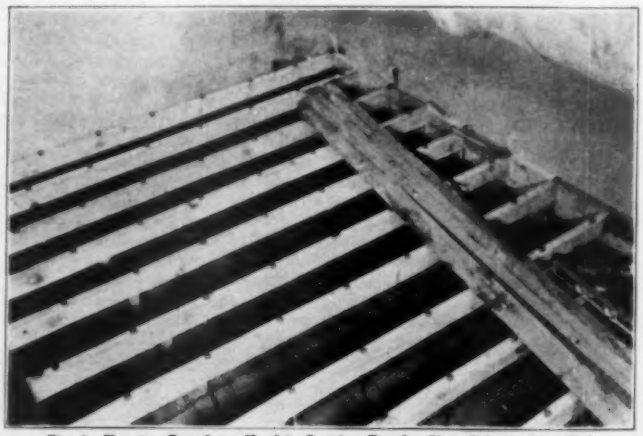

Fig. 4—Showing Templates Used in Spacing Everdur Plate Bolts in 4 in. Slab

12x12-in. plus 0, minus 1/16-in. and 1½-in. thick. The manufacturers seem to be able to obtain quite uniform porosity. The plates used at Cornell were manufactured by the Norton Company. In order to facilitate jointing, these plates were made with a rabbet all around the top edge. This can be seen in Fig. 1. Rabbetted plates were first used by Hotchkiss at Larchmont, N. Y.[3, 4]

In our first filter the joints were made with a marine calking compound using a calking gun. These joints remained quite plastic and it was feared they might blow out during washing so in the other filters the joints were poured with a melted sewer jointing compound. The joints in the first filter appear to have held, however, for a period of nine years and since it is much easier to make the joints with a calking gun we probably will go back to the marine calking compound for any future construction. Joints between the plates and the walls of the filter were made with cement.

Cutouts for the ½-in. Everdur studs were on a ⅜-in. radius for circular and semicircular cutouts, and where studs came at corners of plates they were cut off at a 45° angle 7/16-in. from the corner.

Fig. 5—Completed Filter With Anthrafilt in Place Resting Directly on Porous Plate Bottom *(Bed depth is 30 in. and freeboard the same. Surface of bed is roughly 2 in. below the revolving agitator arm for best washing results.)*

A gage was built into each filter to indicate the loss of head through the plates and filter bed during back washing. This loss of head is a function not only of the resistance of the plates and bed, but also of the wash rate and the water temperature. Initially it is quite small, being between 1 and 2-ft. of water. Partial clogging occurs rapidly due to some penetration of the "fines" in the filtering medium into the pores of the plates. After more than nine years of operation the first filter equipped with porous plate bottoms showed a loss of head of 7.7-ft. with a wash rate of 24-in. vertical rise per minute and temperature of 2° C. After treatment with 100-lb. of concentrated sulphuric acid this loss of head was reduced to 6.1-ft. with the same wash rate and temperature.

In the case of the second filter the loss of head during washing at a 24-in. vertical rise rate and temperature of 2.5° C. had reached 5.4-ft. It was reduced to 3.5-ft. by a similar treatment.

These filters wash much more evenly than others that the author has observed and continue to do so after years of service.

The filtering medium used is Anthrafilt with the rather large effec-

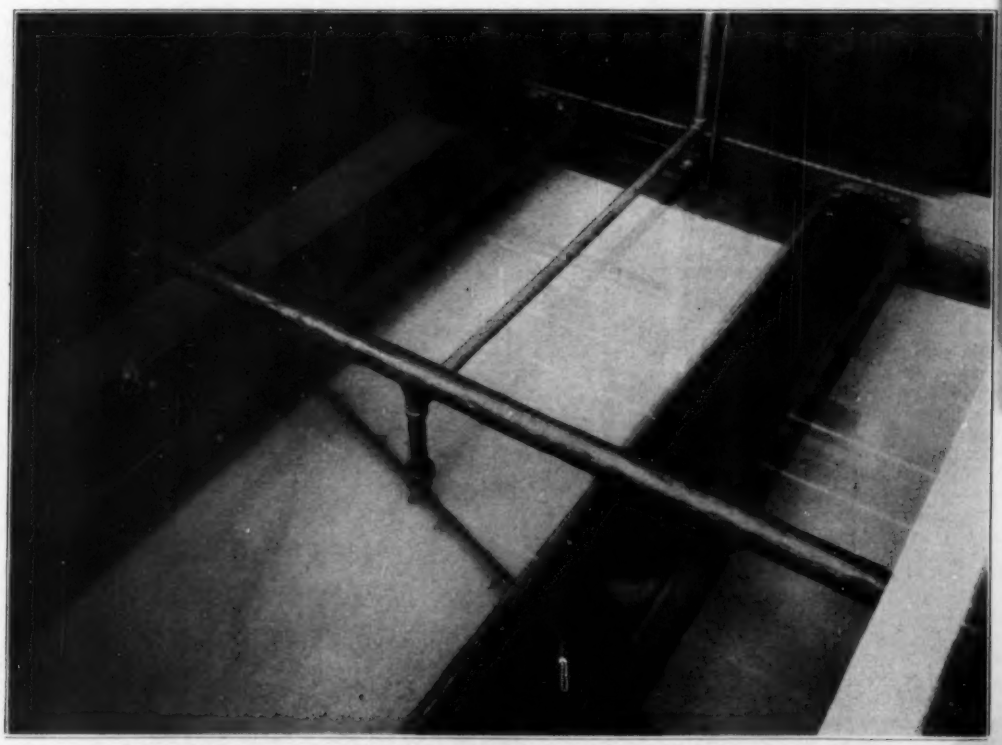

Fig. 6—Close-up of the Finished Filter Troughs and Palmer Agitator with Its Scouring Jet-Nozzles

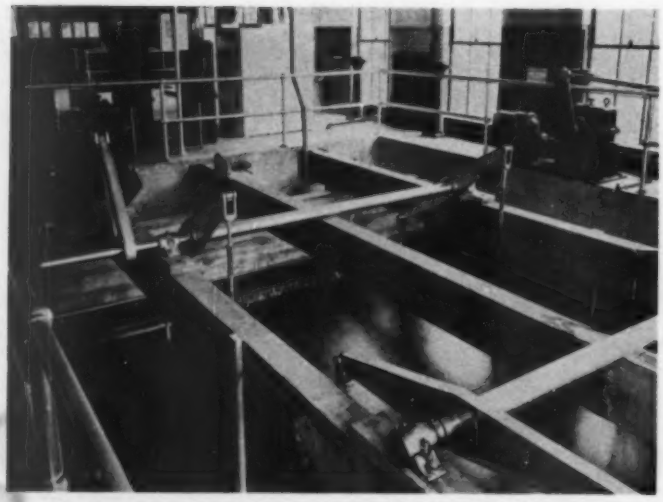

Fig. 7—Stuart-Carter Walking Beam Flocculator With All Bearings Above Water

tive size of 0.70 to 0.72-mm., but with a uniformity coefficient of less than 1.60. The initial beds were were 36-in. deep which gave a 24-in. freeboard to the top of the wash water troughs. With this amount of freeboard there was a gradual loss of Anthrafilt during back washing at the 24 in. rate of rise, and we have now reduced the depth of bed to 30-in. giving 30-in. freeboard. The loss of Anthrafilt under these conditions has become negligible.

The first filter had a series of piezometer tubes built into it as shown in Fig. 3 in order that the distribution of head losses might be studied during operation of the filter. Two typical sets of curves were published by Georgia[3] showing the head losses for long filter runs. These showed that most of the loss developed in the upper foot of the bed. With prolonged filter runs the surface layers show a tendency to cake and require too much wash water for proper cleaning. We now limit filter runs to four days in cold weather and five days in the summer regardless of loss of head.

All filters are now equipped with Palmer Agitators for surface wash. The results obtained have been excellent so long as the top of the filter bed is kept about two inches below the agitator arm. Increasing the freeboard and lowering the agitator to correspond will help to maintain this condition. Fig. 5 shows a completed filter with the Anthrafilt and Palmer Agitator in place.

In a new filter, completed in 1948, the wash water troughs were constructed in a rather unusual manner. They were made from lengths of 20-in. steel pipe from which a longitudinal section was cut to leave an opening 14-in. wide the full length of the filter. Uncut rings were left at each end where the pipe was inserted in a circular recess in the back wall and where the end of the pipe passes through the gullet wall at the front. After the troughs were in place metal lath was stretched over the outside and hooked over the lips of the troughs. Both inside and outside were then given two coats of 1:1 cement and sand mortar containing a liberal amount of Ironite. Care was taken to obtain lips that were smooth and level. The cement was then given two coats of Bituplastic. A close-up of the troughs and the jet nozzles of the Palmer Agitator are shown in Fig. 6.

The wash water troughs in the original filters are of cast iron and have caused considerable trouble from corrosion. The troughs in one of these filters has been cement coated as above and this treatment seems to have solved the corrosion problem.

Most wash water troughs have a flat U shaped cross section as do the troughs in our original filters. Such troughs tend to set up eddy currents in the wash water coming up under them and thus hinder carrying away some of the accumulated dirt. The circular section described is probably not the ideal one, but the flow of water around it during washing appears to be quite an improvement over that in the other filters.

Some of the advantages of filters of the type described may be summarized here. A porous plate underdrain system permits of the use of a uniform unclassified filter bed. Even if wash water distribution is uneven no damage is done to such a filter bed which can not be inverted as the combination of gravel and sand bed can be and so frequently is. If for any reason repairs are necessary the filtering material may be removed from and returned to the filter without the necessity of reclassifying the material. Porous plates probably provide the evenest distribution of wash water obtainable. There is some clogging of the plates but this appears to be uniform and at Cornell has not reached

Fig. 8—The Flocculator Mechanism Showing the Inverted Slatted Trough Design of Dashers Which Travel Up and Down to Produce Heavy Floc

(Note the baffle with center slot separating the two sections of the flocculator.)

serious proportions in nine years of operation. Plates may be partially cleaned by acid treatment. We do not know yet what the life of such a filter will be, but it certainly is much longer than we have obtained with conventional types, and even if clogging reaches a point where renovation and replacement of the plates eventually becomes necessary it should be a cheaper operation than rebuilding other types.

Anthrafilt is only about half as heavy as sand so that greater expansion of the filter bed is obtained at lower wash rates. In general larger sizes are used resulting in lower head losses during a filter run. Quite as effective filtration and polishing of the water is obtained as with sand.

While we have not had experience with other types of surface wash devices we believe the Palmer Agitator to be more effective in scouring the bed, and more economical to install and operate.

Increased Capacity Provided

Both the physical growth and the increased student enrollment during the past few years made it necessary to increase the capacity of the Cornell University Filter Plant. A new wing was added to the plant in 1948 providing for three additional filters, only one of which has been completed. Space for better laboratory facilities was also provided. A mechanical flocculator was installed in the mixing basin in place of the around-the-end baffles with the hope that better flocculation would make it unnecessary to increase the capacity of the settling basins. A flow diagram of the enlarged plant is shown in Fig. 9.

Mechanical Flocculation

The flocculator installed was of the Walking Beam type, originated by F. E. Stuart and sold by the Stuart Corp., and manufactured by the Ralph B. Carter Co. of Hackensack, N.J. It is shown in Figs. 7 and 8, and consists of two units, each having a U. S. Varidrive connected through a Philadelphia Gear Reducer to the walking beam. The first unit has a 5-hp motor and can be operated at any rate from three to nine cycles per minute. The second unit has a 3-hp motor and a speed range of two to six cycles per minute.

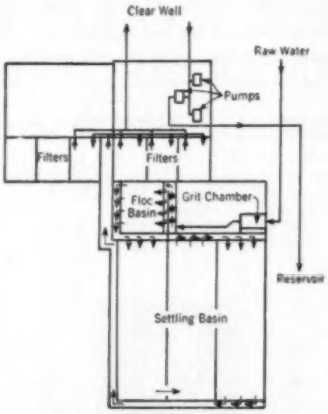

Fig. 9—Flow Diagram of the Plant
(Note the conversion of parallel settling basins into series operation.)

On entering the basin, the water passes along a channel with over-and-under baffles, the last of which is a weir that gives rather good quick mixing. Distribution across the basin is obtained by a concrete wall, over which the water can be seen flowing in Fig. 7.

A baffle was installed between the two flocculator units with a 1-ft. horizontal slot running across the basin at the mid-depth of the water. The baffle had not been built when Fig. 7 was photographed but can be seen in Fig. 8 which shows the basin drained. Also visible are the inverted troughs (dashers) that produce the agitation. All underwater parts of the equipment were made of silicon bronze (Herculoy and Everdur), which was chosen because the equipment cannot be taken out of service for painting.

The walking-beam type of flocculator has no bearings in contact with water and no stuffing boxes are required to isolate them from the water. It was readily adapted to an existing basin.

The source of raw water for the plant is a small surface stream that is subject to sudden, large fluctuations in runoff and suspended matter. During the period for which data are presented raw water turbidities varied from 1.4 to 1000-ppm., with changes of several hundred parts per million in the space of an hour or two.

Regardless of the type of equipment in use it is necessary to apply proper doses of coagulants, and with a water of rapidly changing character considerable aleartness and skill on the part of the filter plant operator is required. Unfortunately, slips sometimes occur and the data to be presented contain some examples of improper coagulation and flocculation.

Since good sedimentation depends on proper coagulation and flocculation the turbidity of the settled water as it goes to the filters may be used as a measure of accomplishment. In this connection it should be remembered that the first result of adding a coagulant to a water is to increase the amount of suspended matter and both the original and this added material must be flocculated and settled out. With very low raw water turbidities the suspended matter added as coagulant may be larger than the original and the settled water may have a somewhat higher turbidity than the original water carried. It may, however, be in better form for removal by the filters.

The data that follow have been re-

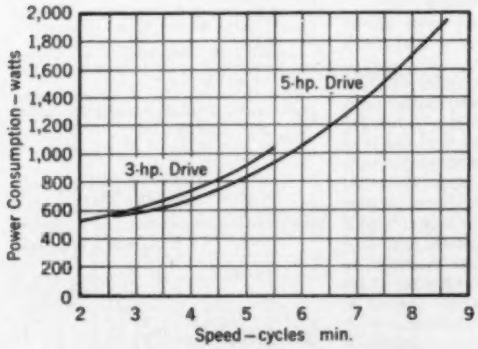

Fig. 10—Flocculator Power Consumption Chart

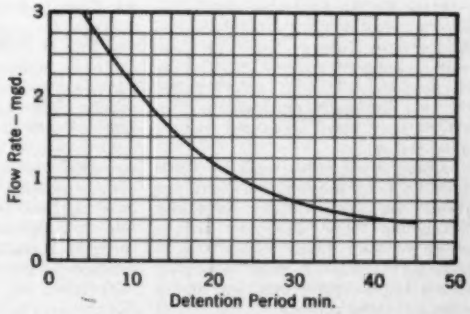

Fig. 11—Flow Rate—Detention Period Graph

Table—1.
TURBIDITY DATA.

Period	Water Treated 1,000-gpd. units			Turbidity—ppm.					
				Raw Water			Settled Water		
	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.
1947									
Mar.	1,365	1,020	1,243	140	1.7	25	11	2.1	4.1
Apr.	1,300	887	1,165	220	3.8	28	22	1.6	3.9
May	1,388	1,021	1,267	700	5.0	45	110	1.1	6.6
June	1,909	826	1,159	650	2.6	37	10	0.5	1.9
July	1,339	939	1,146	90	2.3	9.5	90	0.5	3.9
Aug.	1,274	851	1,065	85	2.3	12	16	0.4	2.4
Sept.	1,386	860	1,214	145	1.0	9.5	3.5	0.6	1.0
Oct.	1,410	1,224	1,352	180	1.8	15	2.5	0.6	1.5
Nov.	1,478	1,035	1,368	105	2.7	13	7.0	1.7	3.9
Dec.	1,486	713	1,287	200	4.0	16	16	3.0	5.0
1948									
Jan.	1,428	1,348	1,395	6.2	1.6	3.5	5.0	2.6	3.7
Feb.	1,435	1,191	1,391	180	2.0	17	14	2.4	5.6
Mar.*	1,454	1,003	1,339	380	10	121	19	2.6	7.4
Apr.	1,404	1,042	1,334	60	3.2	15	10	1.8	3.4
May	1,509	1,362	1,443	44	3.4	15	19	1.5	3.8
June	2,190	1,310	1,642	95	2.1	9.8	10	1.0	2.1
July	2,456	963	1,798	70	3.6	9.1	9.0	1.0	2.7
Aug.	1,510	591	1,141	900	2.7	43	27	0.5	2.5
Sept.	1,646	767	1,212	10	1.4	4.1	2.5	0.6	1.2
Oct.	1,551	1,271	1,472	40	1.5	6.0	3.0	0.7	1.7
Nov.	1,509	988	1,360	850	1.5	41	25	1.1	4.9
Dec.†	1,529	739	1,279	340	1.8	15	5.0	1.5	2.7
1949									
Jan.	2,365	1,019	1,495	260	4.3	20	9.5	2.4	4.4
Feb.	1,595	1,091	1,404	125	3.4	18	8.0	2.6	4.1
Mar.	1,698	1,135	1,477	90	3.5	11.9	6.5	2.2	3.9
Apr.	1,692	859	1,500	73	2.6	11.9	4.3	1.2	2.1
May	1,799	1,272	1,576	40	2.1	6.9	6.5	0.8	2.0
June	1,647	1,065	1,450	1,000	2.2	42	15	0.9	2.7
July	1,635	1,098	1,419	30	3.3	7.6	4.3	1.0	1.7
Aug.	1,596	1,063	1,394	950	2.9	37	6.0	0.6	1.5

Around end baffles were removed Sept. 21, 1947.
*Flocculator started Mar. 16, 1948. Data for Mar. 1-15 not included.
†Baffle installed between flocculator units Dec. 22, 1948.

ported by Georgia[2] previously. They cover a period of a year prior to installation of the flocculator and about a year and a half afterward. Table 1 gives maximum, minimum and average values for the amount of water treated and for the turbidities of the raw and settled water by months.

About six months before the flocculator was installed the around-the-end baffles were removed from the basin with no apparent adverse effect on the results obtained. The baffle between the two flocculator units was not installed until after about ten months of operation.

Examination of the data of Table 1 shows good minimum and average results for settled water turbidities throughout. The maximum values, which in some instances are due to improper dosages, show a rather steady improvement even for higher rates of operation.

Table 2 shows the coagulants used and the rates of feed. Alum was used at all times while the other materials were used to aid floc formation. It is to be noted that mechanical flocculation not only gave a better settled water but that this was accomplished with a lower coagulant dose.

In June 1948 the raw water line to the City of Ithaca Filter Plant was damaged by a landslide. During June and July of 1948, and again for a period in January 1949, water was furnished the city from the University supply. This accounts for the high rates of operation for those periods.

Both of the flocculator units are equipped with variable drives as previously mentioned. The higher speeds have not been found useful, and it is felt that, although some variation in speed is desirable for different water conditions, the advantage gained is outweighed by the additional cost. Fixed drives of four cycles per minute for the first unit and three cycles per minute for the second would probably be best at the Cornell Plant.

H. T. Zimmerman, of the Ralph B. Carter Co., made some measurements of power consumption on the two units shortly after they were installed. His results are shown by the curves in Fig. 10. The equations for these power curves, whoich were developed by Howard Golub[6], are:

For the 3-ph. flocculator:

$$\text{Watts} = 38.5\ (\text{cycles/min.}-1.25)\ 1.8 + 500$$

for the 5-hp. flocculator:

$$\text{Watts} = 55\ (\text{cycles/min.}-2.6)\ 1.8 + 580$$

Operation costs are much lower for the slower rates. No attempt has been made to compute the cost of operation per million gallons of water treated, since the rate of flow through the basin is subject to rather wide variation, while the rates at which the flocculators are operated remain nearly constant. The flocculator basin proper has a volume of 15,600 gal. The detention period is plotted against flow rates in Fig. 11. The plant has been operated successfully at rates as high as 2.5-mgd., which gives only eight minutes in the flocculation basin and about four hours in the settling basins. This rate was attained by operating the present four filters above their rated capacities.

The above results seem to justify the original assumption that mechanical flocculation would improve the preparation of the water to such an extent that filter capacity could be increased materially without increasing the capacity of the settling basins.

It is hoped that funds may be available in the future for proper dechlorination and for automatic corrosion control.

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Table—2.
CHEMICAL FEED DATA.

Period	Avg. Rate of Feed—ppm.			
	Alum	Lime	Soda Ash	Sodium Aluminate
Mar. 1947–Mar. 1948	30.1	2.7		0.5
Mar. 16, 1948–Jan. 1949	26.3	5.1		
Jan. 1949–Sept. 1949	24.8		1.4	

SODIUM FLUOSILICATE FOR FLUORIDATION

Replaces Sodium Fluoride in Plant Scale Trial as Economy Measure

by

JEROME C. ZUFELT

Superintendent

BOARD OF WATER COMMISSIONERS

SHEBOYGAN, WIS.

SINCE Sheboygan began to fluoridate its public water supply on Feb. 25, 1946, the cost of the 90 per cent dense white sodium fluoride, which has been used, has risen from $8.49 to $11.14 per 100 lb. delivered into the chemical storeroom of the plant.

Other fluoride salts are available as a source of the fluoride ion, such as ammonium silicofluoride and sodium fluosilicate. The latter was brought to our attention by a manufacturer of it, with the assurance of its availability in ample supply, and at a delivered price of approximately $3.50 per 100 lb.

Sodium fluosilicate is Na_2SiF_6.* It contains 60 per cent available fluoride as compared to the approximate 40 per cent in the NaF now in use. Its higher fluoride content and lower cost per pound therefore offers an opportunity to save about 75 per cent of the money now being spent for fluoride material. Stated another way the per capita cost per year for fluoride material in Sheboygan would be reduced from 10 to 2½ cents.

A sample of the sodium fluosilicate was obtained from the Blockson Chemical Co. of Joliet, Ill., who furnished the following analysis of their material:

Na_2SiF_6	99.2%
P_2O_5	0.2%
CaO	0.1%
Al_2O_3 and Fe_2O_3	0.02%
H_2O	0.2%
F	60.6%
pH of 1% sol.	3.5
Solubility in 100 grams H_2O	
0 deg. Cent.—	.435 grams
2 " " —	.456
10 " " —	.542
25 " " —	.77
60 " " —	1.43
100 " " —	2.45

Low Solubility

The low solubility of the material as compared to the 4 per cent solubility of NaF required investigation to determine if the solution box and water supply of the dry feed machine were adequate. For the maximum rate of feed and minimum water temperature five gallons per minute of water were found to be necessary, the machine was supplying five and one quarter gallons per minute which could be increased if necessary.

The Author

Solutions of the fluosilicate in the 1 ppm. range of fluoride were carefully made up gravimetrically and subjected to the Scott-Sanchis fluoride determination by J. A. Rutkauskas, Superintendent-Chemist of the filter plant, in the same manner as applied to the daily fluoride determinations. The tests checked the theoretical content of the solutions in each case.

The physical quality of the material appeared to be comparable to that of the sodium fluoride in use in fineness and flow characteristics. Within its solubility limits it appeared to dissolve as rapidly as NaF and more completely than NaF, no doubt because of its lesser impurities.

Feeding Characteristics

To determine the feeding characteristics of the material in the Omega gravimetric loss-in-weight type dry feed machine, and its reaction to tests on a plant scale, a 1000 pound quantity was purchased. On Oct. 4, 1949, after emptying the feeder of NaF and thoroughly cleaning the hopper, solution box, and feed lines which required a shutdown of the machine for several hours, feeding of the fluosilicate was started.

The material was fed at a rate of 13.8 lb. per mil. gal., the theoretical quantity of 99 per cent Na_2SiF_6 to supply 1 ppm. of fluoride. The material dissolved well in the solution box of the feeder, and caused no difficulty in the feed gate of the machine. Its feeding characteristics were in every way comparable to the NaF we had been using.

Table I is a copy of the laboratory report of fluoride determinations for the month of October, 1949. The period from Oct. 4 to Oct. 15 is that during which the sodium fluosilicate was fed, as indicated in the table by the ruled lines. A probable three day lag in effect at the distribution system sampling points is indicated. It would appear from a comparison of the parts per million fed with the results of the tests on the samples that the material reacts in every way in a manner identical with sodium fluoride.

Considerable thought has been given to the possible effects on the dental decay prevention program of changing to sodium fluosilicate. Substantial gains in decay prevention are already apparent in Sheboygan, particularly in deciduous teeth, as a result of the four years of fluoride treatment. It would be unfortunate to lose these gains by substituting a material other than that whose efficacy is at least partially proven.

Dr. M. Starr Nichols, Assistant Director of the State Laboratory of Hygiene, and Professor of Sanitary Chemistry at the University of Wisconsin, has investigated this question with considerable thoroughness. The following is the text of a letter written to us by him on the subject before our trial run was made:

"I have been checking over the evidence for the use of sodium fluosilicate to furnish the fluoride ion for supplementing waters deficient in fluorides. From all evidence available to me, it seems chemically and physiologically sound to use sodium fluosilicate as a carrier of the fluoride ion in the supplementation of fluoride deficient waters and I would not hesitate to use it. Some of the evidence

*Sodium fluosilicate and sodium silicofluoride are one and the same thing. The compound is sold in commerce under both names; but, more correctly, it is a fluoride (Na_2SiF_6) and not a silicate.—Ed.

TABLE I

FLUORIDE APPLICATION - Sheboygan, Wis. October 1949

Date	Gallons Treated (Thousands)	Sodium Fluoride Applied		Residual Fluorine (F) p.p.m.							
		Pounds NaF	p.p.m. as F.	Filter Effluent	Plant Tap 9 a.m.	Plant Tap 4 p.m.	Plant Tap 12 p.m.	Distribution System Location	p.p.m.	Location	p.p.m.
1	5320	106	1.02	.20	1.15	1.25	1.25	1005 Indiana Ave.	1.10	1030 S. 14th St.	1.15
2	5342	106	1.01	.25	1.15	1.20	1.20	" " "	1.15	—	
3	6948	115	.84	.15	1.20	1.15	1.15	1516 S. 12th St.	1.20	2206 N. 15th St.	1.25
4	6674	52	.56	.15	.60	.20	.60	" " "	1.20	1035 Indiana Ave.	1.15
5	7020	116	1.17	.20	1.00	1.15	1.25	" " "	.70	521 Ontario Ave.	1.00
6	6706	90	.97	.15	1.90	1.00	1.05	" " "	.90	2105 Union Ave.	.90
7	6676	92	1.00	.15	1.05	1.15	1.15	" " "	1.05	1827 N. 10th St.	1.10
8	5244	72	.99	.25	1.15	1.15	1.15	—		1930 S. 13th St.	1.05
9	4852	66	.98	.15	1.20	1.15	1.15	1005 Indiana Ave.	1.15	—	
10	7060	96	.98	.25	1.10	1.15	1.10	1516 S. 12th St.	1.10	1238 Geele Ave.	1.10
11	6036	93	.90	.15	1.10	1.20	1.20	" " "	1.10	1017 Union Ave.	1.10
12	6688	91	.98	.15	1.15	1.15	1.15	—		—	
13	6688	92	.99	.15	1.15	1.05	1.05	" " "	1.15	1139 Penn. Ave.	1.15
14	6554	88	.97	.25	1.05	1.05	1.10	" " "	1.10	836 Michigan Ave.	1.15
15	5958	88	1.02	.25	1.10	1.10	1.10	2016 Broadway	1.05	1514 S. 12th St.	1.15
16	4738	95	1.02	.25	1.05	1.15	1.15	" " "	1.05	—	
17	6848	137	1.02	.15	1.20	1.25	1.25	1516 S. 12th St.	1.10	2029 N. 15th St.	1.20
18	6418	129	1.02	.15	1.25	1.20	1.20	" " "	1.20	1215 Broadway	1.20
19	6712	133	1.01	.25	1.15	1.15	1.20	" " "	1.20	1036 Michigan Ave.	1.20
20	6881	138	1.02	.15	1.20	1.20	1.20	" " "	1.20	825 S. 8th St.	1.20
21	6585	134	1.02	.15	1.15	1.20	1.15	" " "	1.15	1126 North Ave.	1.20
22	5358	108	1.01	.20	1.20	1.15	1.15	2016 Broadway	1.15	1503 Broadway	1.20
23	4742	96	1.02	.20	1.15	1.15	1.20	—		—	
24	6392	128	1.02	.20	1.25	1.15	1.15	1516 S. 12th St.	1.20	1512 Mehrtens Ave.	1.20
25	6668	134	1.02	.20	1.15	1.20	1.15	" " "	1.15	3333 Lakeshore Drive	1.15
26	6950	141	1.03	.15	1.15	1.15	1.20	" " "	1.15	1429 North Ave.	1.15
27	6749	136	1.03	.15	1.20	1.20	1.15	" " "	1.20	1502 Indiana Ave.	1.20
28	6102	122	1.02	.20	1.20	1.20	1.15	" " "	1.15	1331 Erie Ave.	1.15
29	5505	110	1.02	.20	1.20	1.20	1.15	2016 Broadway	1.15	1030 S. 14th St.	1.15
30	4516	90	1.02	.40	1.15	1.20	1.20	—		—	
31	6484	131	1.03	.15	1.20	1.15	1.15	1516 S. 12th St.	1.20	828 N. 7th St.	1.20
Total											
Av.	This data omitted because of use of two kinds of fluoride.										
Max.											
Min.											

p.p.m. as F applied = Tot. lbs. applied per MG x .081 (wt% NaF is 45.5% F.)

upon which I base this opinion are given below:

"1. Many of the igneous rocks (siliceous in nature) contain fluoride probably as fluosilicates. Colorado Springs, Colo., obtains its water (2.6 ppm. F) from the run-off of the Rocky Mountains. These mountains are of igneous origin. We do not know, but can surmise, that many waters dissolve the fluosilicates to furnish the natural fluoride found in these waters.

"2. Margaret C. Smith and Ruth M. Leverton in Industrial and Engineering Chemistry for July 1934, Vol. 26, p. 791, found that both sodium fluoride and sodium fluosilicate were able to produce mottled enamel of equal intensity on the teeth of rats when these rats were fed each of these substances in amounts so that the intake of combined fluorine was the same. They also found that growth rate, interference with reproduction and lethal dose was the same with either substance when used on an equivalent combined fluorine basis.

"3. Muelberger, in the Journal of Pharmacology and Experimental Therapeutics, Vol. 39, p. 246 (1930) found that on a combined fluorine basis sodium fluoride and sodium fluosilicate had equal toxicities when the tolerated dose and the lethal dose was determined.

"4. The same analytical methods are used to determine fluoride content of each of these chemicals in the range of 1 to 10 parts per million.

"5. I have conducted experiments which show that sodium fluosilicate can be converted to sodium fluoride and a siliceous residue either H_2SiO_3 or H_4SiO_4.

"6. In Chem. and Eng. News, August 22, 1949, Vol. 27, No. 34, page 2421, there is given some data to show that sodium fluosilicate breaks up in water ultimately to yield cations, fluoride ions and a silica residue which probably is colloidal in nature.

"I am now convinced that the fluoridation program for the partial prevention of dental caries will not be jeopardized in the least manner by the use of sodium fluosilicate in the place of sodium fluoride."

If the local Sheboygan health department, under whose jurisdiction the fluoride program is being carried out, obtains permission from the State Board of Health to use the sodium fluosilicate, and so orders the Water Dept., it is planned to make a more prolonged trial run of probably an entire month before contracting for a year's supply of the material.

Ed Note: In our May issue appeared an announcement that Milwaukee's Council has voted to begin fluoridation of its water supply Jan. 1, 1951, employing sodium silicofluoride. The chemical cost is estimated at $20,000 per year as compared to $98,000 which was the estimated chemical cost earlier when sodium fluoride was to be used.

Chlorine Corrects Sludge Bulking*

The following experiences with chlorination of returned activated sludge to correct sludge bulking and inferior effluent at Carbondale, Ill. The article* was written by H. U. Hill, Supt. of Sewage Treatment at Carbondale, Ill.

Carbondale's activated sludge is overloaded although only four years old. Population has almost trippled; industrial waste in the form of dairy products and laundry wastes have added to the problem. Bulking of the sludge and inferior effluent become a problem. Various methods, including copper sulphate and return of digester contents to the aeration tanks, were tried without benefit. Then we turned to chlorination of the recirculated activated sludge which has proved effective during more than two years.

For two years we used a homemade chlorinator applying chlorine to the returned sludge at the rate of 12 lbs. or more per day to returned sludge at various rates up to 325,000 gals. per 24 hours. The treatment was effective in keeping the Sludge Index below 100 even with the 35 to 45% plant overload. The effluent before chlorine treatment had a B.O.D. of almost 80 ppm. on the average. This was reduced by the treatment to an average usually below 30 ppm. B.O.D. with dissolved oxygen maintained, whereas before chlorination no oxygen was present most of the year.

During periods when shock loads reach the plant it is difficult to prevent rising of the sludge blanket but otherwise the chlorination has been effective in preventing rising sludge in the final tanks. An enlargement of the plant or curtailment of industrial waste loadings is to be the ultimate solution. B.O.D. of the crude sewage frequently reaches 550 ppm. and the primary tank effluent 380 ppm.

An insurance inspector insisted on the discarding of the makeshift chlorination set-up as being a hazard. Fortunately the sewer rental revenue permitted the purchase of a Wallace & Tiernan Chlorinator which is delaying the day when plant enlargement or refusal of industry's wastes will be a necessity.

*From an article appearing in "The Digester," published by the Ill. State Dept. of Health.

Water Co. Secures Funds at Something Less Than 2⅞%

The Scranton Spring Brook Water Co. of Scranton, Pa., seeking a loan of $1,000,000, has received bids from 10 leading insurance companies. The best bid was that by the John Hancock Mutual Life Ins. Co. on the first mortgage bonds at $101 per $100 of loan. The attractive interest rate of 2⅞% will be paid on the bonds. The funds are to be used in a program of construction and betterments.

Ohio River Compact Commission Changes Officers

At the quarterly meeting in April of the Ohio River Compact Commission, new officers were elected for the ensuing year to take office on July 1. Succeeding Jos. L. Quinn (Terre Haute), as Chairman, is Henry Ward, Comm. of Conservation, of Kentucky. Succeeding Mr. Ward is Vice Chairman is Clarence W. Klassen, Tech. Sec'y. Illinois Sanitary Water Board and Chief Engineer of the Illinois State Board of Health.

F. H. Waring, Chief Engr., Ohio Dept. of Health, was re-elected Secretary of the Commission. Robt. K. Horton, sanitary engineer on the Commission staff, was elected Treasurer of the Commission. Edward J. Cleary is Executive Director and Chief Engineer.

In reviewing the work of the Commission, outgoing chairman Jos. L. Quinn pointed out that only 11 per cent of the cities of more than 5,000 population in the area encompassed by the Ohio River Compact Commission have taken no action toward the installation of sewage treatment facilities. Reports from 311 municipalities were compiled for this information. Mr. Quinn cited this as encouraging evidence that the states are aggressively promoting pollution abatement measures. Actually only 76 cities have proper treatment works; another 31 cities have plants but they are inadequate. There are 144 communities now preparing plans for construction.

ADVANTAGES OF A CHEMICAL ELEVATOR AT SMALL WATER PLANTS

by
HOWARD J. SOWDEN
Sup. and Eng.
WATER AND LIGHT DEPARTMENT
FERGUS FALLS, MINN.

THE chemical service elevator at the Fergus Falls Softening Plant is used exclusively to lift sacks of chemicals from the receiving dock on the ground floor to the second floor storage space. With two men unloading the truck and loading the elevator it will deliver at a rate of about five sacks per minute. The sacks are loaded on the novel elevator steps by hand and are automatically tripped off above the second floor level onto a chute as is shown in the accompanying pictures. From here they are loaded onto a swivel-wheeled wagon-type truck and moved to the storage area.

A short distance below the head pulley of the elevator there is a limit switch behind each channel on the "up" side. If a loaded step should not trip before it reaches this point, the switches shut the motor off and set a magnetic brake. This eliminates the possibility of a bag being carried over the top and being dropped on the other side.

The unit is driven by a 1½ H.P. totally-enclosed motor through a special double acting flexible coupling and a gear reducer unit. It can be started or stopped at any level by means of a rope running the full length of the elevator. This rope is seen on the right of the elevator on the ground floor.

The Author

The Fergus Falls Water Softening Plant is located at a point within the city which requires all chemicals to be trucked from the railroad cars to the plant, a distance of approximately one-quarter mile. High calcium hydrated lime is received in one hundred pound bags shipped to us in thirty ton carloads, making a total of six hundred bags to be unloaded. A crew of four men using one truck can easily unload transport and store the car of lime in eight hours time. This would be an impossibility if it were not for our elevator.

This elevator is known as the "Nordyke Service Elevator," manufactured by the Allis-Chalmers Mfg. Co. of Milwaukee. The unit occupies very little space. In our case it could be installed in an unused area of the plant, a space of 4′ 9″ by 5′ 4″. From the photos it can be seen that, if need be, this area could have been much smaller.

I was rather surprised to learn how few of the smaller plants have chemical handling elevators; also, how few operators seem to know about this labor saving device. It is not overly expensive and saves so much labor and time. I, therefore, recommend that those operators who are operating plants without an elevator for handling chemicals investigate the feasibility of using this or a similar type of elevator. And, the same can be said to engineers who design small water treatment plants.

Nordyke Service Elevator at Fergus Falls Water Treatment Plant

(View on left is the head of the elevator on chemical storage floor. The step in view is ready to trip and slide the bag onto the unloading platform. View on right shows 100 lb. bags of lime being unloaded and placed on steps of elevator on the ground floor.)

RICHMOND'S NEWEST FILTRATION PLANT

Some Novel Design Features of Richmond, Va's., Purification Plant No. 2

by
MARSDEN C. SMITH
Chief Water Engineer
DEPT. OF UTILITIES
RICHMOND, VA.

The Author

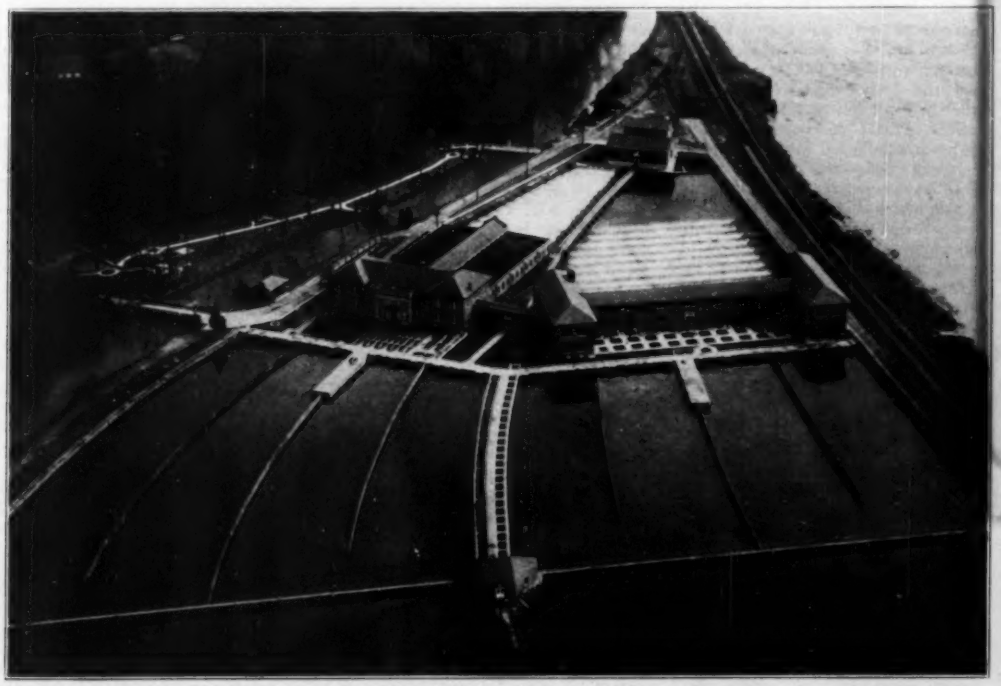
FROM experiences gained through the years of operating the old Richmond, Va., Filter Plant, the designers of the new Filter Plant were able to plan a plant that should materially reduce the cost of water purification.

This only moderately applies to chemical efficiency, because the old plant has kept abreast of the best practices; in fact, has pioneered in many improvements and economies in water treatment.

The filters in the old plant have proven so efficient that their design features were employed in the new construction. The sand, however, was made 0.55 mm. effective size rather than 0.43 mm. as was used in the old plant. Concrete rather than steel troughs are used and a slight modification was made in the under-drains.

Also valve position indicators were omitted and small green and red lights to indicate full open, intermediate, or closed positions are being used instead. All filter table gauges and rate-setters are mechanically operated.

One major innovation was the elimination of the customary expensive and space consuming wash-water tank. At no additional expense, the



General View of Richmond's Two Filter Plants

In the immediate foreground are the two raw James River water subsidence basins, separated from the baffled coagulated water clarification basins by the horizontal wall. In the center foreground is the low lift pumping station and flow control. The twin raw water conduits are in the center leading from the low lift pump house.

On the left is the old plant, with the mixing chambers in front of the main building, the filters under cover, and its aerator basin beyond the filter building.

On the right is the new plant, with its outside filters in foreground, and its the aerator basin beyond the building.

One of the buildings at far end of plant is a pumping station delivering water to the city. The other is the lime storage and feed control building for anti-corrosion treatment of the finished water leaving the plant.

new aerator pumps were slightly modified to make them available to supply the washwater.

Hydraulic valves between the pumps and the aerator field, which valves are remotely operable from each filter table, divert water as desired from the aerators to the wash water header to the filters.

Filters in the Open

An unusual feature in this climate is the omission of enclosing structure for the twelve filters. Because of the dampness, the present filter building is extremely expensive to maintain. Hence this decision not only greatly reduced construction cost, but will eliminate severe maintenance expense as well.

The perhaps desirable, but non-essential bronze doors and similar artistic and impressive architectural features, frequently adopted, have been omitted.

The building materials used are fireproof and the most economical.

Aluminum Windows

Tile has been used rather than painted plaster; aluminum window casings and sash, rather than rusting steel or rotting wood. It is believed that the cost reduction in painting alone will exceed $8,000 per year.

The aerator pumps are equipped with variable speed motors, remotely controlled from the operator's desk. This was necessary to permit the desirable increase in finished water storage between the plant and pumps delivering water to the city.

An entirely new and complete lime storage and feeding station was constructed. The new slakers discharge directly into the finished water thus eliminating the undersirable and difficult necessity of transmitting lime solutions several hundred feet.

The heating of both the old and new plants is now provided by bin-fed, stoker-fired boilers. Coal is unloaded from the car by conveyor into storage bins in which are the feeders to the stokers. Thus, with normal coal supply, no handling of fuel will be required.

Storm water emergency pumps are provided which will permit uninterrupted plant maintenance which previously has been impossible during periods of high water levels in the river.

Means are provided so that at several stages of the purification process either plant may receive the entire water flow. Thus any part of either plant may be removed for repair yet permit operations to continue up to the full capacity of the remaining sections. This also allows the two plants to be operated entirely independently and in parallel, or together as may be most expedient.

Filter Valves Have Flexible Connections

The design of the large valves controlling the filters has been greatly improved by the use of "plain-ends" connected by flexible couplings. This eliminates dangerous stresses on the valve bodies, due to expansion and contraction, and also provides a simple means of replacing the valve, or its removal for repairs.

Greatly improved means for maintenance of uniform temperatures in the chemical gassing room (chlorine, sulfur dioxide, ammonia) have been provided. A blower under thermostatic control can either circulate the air in the room with or without electric heat being added; or, with heat from the building heating system, or any combination.

Dust Elimination

The reduction and disposal of chemical dust was carefully designed. Escaping gaseous chemicals and/or dust are discharged at high velocity through a chimney similar to that serving the heating system. Dust from the chemical feeder hoppers is exhausted, wetted and discharged by a water ejector into the raw water being treated with these same chemicals.

New and attractive quarters have been provided for the operating personnel. Also air-conditioning was included for the laboratory serving the new plant. It is believed that these concessions to the comfort of the personnel will pay off.

Basin Operation

Because of the original design and construction of the dividing walls, it has heretofore been necessary to remove two of the four coagulating basins whenever necessary to wash any one basin.

These walls have been so reconstructed that it is now possible to clean each basin separately. This fifty per cent increase in minimum coagulated water storage capacity will be of greatest value.

The new bulk chemical unloaders are provided in duplicate and are arranged to permit railroad cars or trucks to be placed on either the old or new railroad sidings. This was done not only to increase reliability but to double the otherwise limited storage and to avoid demurrage or delivery truck delays.

Centralized Control

All of the main plant gauges, both rate of flow and levels, as well as the control of water levels throughout the plant, are located at the plant operator's desk. Immediately adjacent are the machines controlling both gaseous and solid chemicals; thus reducing to a minimum the effort required for efficient plant operation.

Court Upsets West Virginia Sanitation Pact

The West Virginia supreme court has rendered a decision that West Virginia's legislative act of 1939 authorizing the state to participate in the eight-state Ohio River Valley Sanitation Compact is unconstitutional. Through this decision West Virginia must withdraw from the compact, and the court also is withholding payment of West Virginia's share of the expense of operating the Ohio River Valley Sanitation Commission the first year. In this decision the court was divided 3 to 2.

ASCE Spring Meeting in Los Angeles

At the Spring Meeting of the Amer. Soc. of Civ. Engrs. held in Los Angeles, April 25-29, included two sessions of the Sanitary Engineering Division.

Presided over by Ray L. Derby, San. Engr., Los Angeles Water, Light and Power Division, the meeting included papers on Resinous Ion Exchangers, by W. W. Aultman, Metr. Water Dist. of So. Calif.; Pollution of Underground Waters by A. G. Pickett, Los Angeles; Diatomaceous Earth Filtration by Jos. M. Sanchis and John Merrell of the Los Angeles Water Dept.; Air Pollution Control by G. P. Larson, Los Angeles, Calif.; Sewage Disposal in San Francisco Bay Area by E. A. Reinke, Calif. Dept. of Health; and Are We in for a Long Draught? by Franklin Thomas, Calif. Inst. of Tech.

At the Sanitary Engineering Luncheon, G. A. Parkes, Bur. of Civ. Engr. of Los Angeles told about the Los Angeles new $40,000,000 Activated Sludge Plant.

Some "Perspiration"

It is estimated that an ordinary elm tree of medium size will give off fifteen thousand pounds of water in a clear, dry, hot day.

CANADIAN SECTION AWWA 30th ANNUAL MEETING

Chairmen

Incoming	Outgoing
Ron. Harrison	*Nicol MacNicol*
Manager	*Commission*
Pub. Util. Comm.	*Pub. Wks. Dept.*
Scarborough, Ont	*Forest Hill, Ont.*

FOR the 30th annual meeting, the Canadian Section AWWA returned to Niagara Falls, Ont., for the seventh time, five of which have been in the last eight years. Registration this year totalled 728, topping last year's figure by 154 and approximating the attendance at the same city two years ago. In addition to the annual banquet and dance, one evening was devoted to entertainment sponsored by the Equipment Association, which also sponsored the "Club Room." A complete ladies program and an inspection and lunch as guests of the city, at the St. Catherines filter plant were added features of the convention.

One of the highlights of the meeting was the presence of eight of the twenty-three living past presidents of AWWA. Included were W. W. Brush, H. E. Jordan, L. R. Howson, Ross L. Dobbin, N. J. Howard, S. F. Newkirk, Jr., L. H. Enslow, and the current president, Dr. A. P. Black. In recognition of their attendance each of these men was presented with a beautifully bound book, "Canada the Unknown Country." The red leather cover was embossed with each past president's name in his own signature (a surprise) and each book was autographed by members of the Executive of the Canadian Section.

The secretary reported a new membership peak for the section. As the meeting started the membership stood at 490 and at the end it had reached 515; last year it was 459.

New Officers

New officers for the ensuing year were elected as follows:

Chairman
Ronald Harrison, Mgr.
Public Util. Comm.
Scarborough, Ont.

Trustees
C. S. Anderson, Supt.
Dept. of Public Wks.
So. Porcupine, Ont.
I. P. Macnab, Gen. Mgr.
Pub. Serv. Comm.
Halifax, Nova Scotia

Other members of the Executive are Nicol MacNicol, W. D. Hurst, T. J. Lafreniere, C. G. R. Armstrong, J. W. D. Farrell, W. E. MacDonald and W. T. Randall. The new Executive of the Equipment Association includes George Morgan, Chairman; J. B. Kinney, Secy.-Treas. and E. J. Buckley, J. Milne, G. M. Gass, H. V. Woolidge, and J. M. McGuire.

A.W.W.A. Director
W. E. MacDonald
Engineer
City Water Wks.
Ottawa, Ont.

Secy.-Treas.
A. E. Berry
Director
San. Engr. Div.
Ont. Dept. Hlth
Toronto, Ont.

Peterborough River Crossing

"A River Crossing at Peterborough, Ont.", by R. L. Dobbins, Gen. Mgr., Utilities Commission, Peterborough, Ont.

By means of slides, Mr. Dobbin presented an interesting story of an unique river crossing. Twin lines, two feet apart, and 12 in. in diameter were constructed of 45 lb. steel pipe welded together. The welding was done on the bank of the river, then the pipes were plugged, rolled down into the water and floated into place.

The construction created considerable interest on the part of the public most of whom thought the pipe would not float (it did). The pipe laying cost $35 a foot and it required one month to sterilize it. Both the water main and sewer can be flushed if necessary.

Water Works Revenues

"Willing Water—Healthy or Anemic" by Louis R. Howson, Cons. Engr., Alvord, Burdick and Howson.

Under this title, Mr. Howson proceeded to examine the current situation as regards water works costs and revenues. In the paper it was pointed out that "Willing Water" must have a sufficient diet of money or it cannot continue to serve the public. Although current income is equal to or greater than prewar, today's dollars are only worth half as much because of inflation.

Mr. Howson presented data on ratio of expenses to operating revenues (53.8 per cent) for a number of representative cities. Projecting these data shows that from the gross income, a utility has only $14.25 per consumer available after operating costs are paid. Assuming fixed costs the same as prewar, then the amount of money available for plant expansion is but $7.35 per year per consumer. That amount will build only about half as many facilities (mains, plants, etc.) as were built for normal conditions in 1940.

Mr. Howson concluded that water works must not be forced to curtail development as is now largely necessary due to inadequate rates and revenues; that due to the war there is at least a 3 year lag in new water works construction at the present time; and that as a general average, water works revenues should be increased about 35 per cent, if capital is to be available for new construction.

Mr. Howson also stated that rate fixing bodies should be realistic and recognize that if the mutual interest of the utility and its consumers are to be served then rates must be sufficient to allow the utility to live, serve and develop. More than half of all water consumers now pay less than 5 cents per day per family. The difference between starvation and fair rates is

Equipment Assn. Exec.

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usually less than 2 cents per family or about ½ cent per capita per day.

In the discussion of the paper, W. STORRIE, Cons. Engr., Toronto, Ont., concurred with Mr. Howson, that development of water supplies has not kept pace with the demand, and in order to keep up with the required expansion, utilities must have higher rates. The public should not object to an increase, particularly if it is informed of the need for higher rates.

Mr. Dorrance spoke at length on the function of valves in a distribution system, types of valves, their construction features, need for easy closure under unbalanced pressure and the practice of using valves smaller than the mains.

Maintenance of valves is essential in order that they will be assured of closing when the need arises. Maintenance and inspection records should be kept on all valves. Mr. Dorrance gave details of records to be kept and how it should be done.

Ross L. Dobbin
Gen. Mgr.
Util. Comm.
Peterborough,
Ont.

G. H. Baker
Supt.
Water Wks.
No. York Twp.
Ont.

— Programmers All —

A. P. Black
Head
Chem. Dept.
Univ. of Fla.
Gainesville, Fla.

L. R. Howson
Cons. Engr.
Alvord, Burdick
& Howson
Chicago, Ill.

Wm. Storrie
Cons. Engr.
Gore & Storrie
Toronto
Ont.

W. D. Hurst
City Engr.
Eng. Dept.
Winnipeg
Man.

The second discusser of the paper, W. D. HURST, City Engineer, Winnipeg, Man., said that the extent to which a water utility can continue to function under present inflationary conditions without increasing water rates depends on several factors including: The rate of growth; past financial policy as regards retirement of capital borrowings and the extent to which capital expenditures have been financed in advance through revenue; and the unit cost of new business in relation to existing business. Mr. Hurst cited his own utility to show how operation costs including taxes had increased from 53 to 66 per cent in 10 years. Mr. Hurst concluded that Mr. Howson's paper brought out the need for uniform accounting and periodic rate surveys.

Distribution System Valves

"INSTALLATION AND MAINTENANCE OF VALVES IN A WATER WORKS SYSTEM" by R. Y. Dorrance, Engineer in Charge of Aqueduct Sect., Public Works Dept., Montreal, P.Q.

The existence of a city is based on an adequate water supply according to Mr. Dorrance, who pointed out that an adequate water supply depended on an adequate distribution system. Adequate fire protection depends on the size of mains.

Large mains are now being made of steel or reinforced concrete pipe, while cast iron pipe is still used for smaller mains, but they corrode so utilities are turning to lining with cement or to asbestos cement pipe.

In discussing this paper, A. U. SANDERSON, Chief Engr., Dept. of Works, Toronto, Ont., told about the Toronto system. His department prefers stop valves of the wedge type and uses shouldered ends on valves to fit Victaulic Couplings. He explained the different types of valves and where they are used in his system.

Ground Water Supplies

"DEVELOPMENT AND MAINTENANCE OF UNDERGROUND WATER SUPPLIES" by T. L. McManamna, Pres. and Gen. Mgr., International Water Supply, Ltd., London, Ont.

This paper was read by J. W. Kirk of London, Ont. Most of the ground water supplies in Ontario are approximately 200 ft. deep and are relatively hard. Only five are softened. Mr. Kirk reviewed ground water characteristics, well construction, corrosion of well equipment, lowering of ground water levels, etc.

The paper concluded with a plea for sound conservation and a utilization of proper ground water storage.

GUIDED DISCUSSIONS

Once again the "Guided Discussions" were helpful and interesting. The participation in these discussions was lively and so prolonged that it was impossible to complete all of the scheduled questions.

Miscellaneous Problems

Under the Chairmanship of G. H. BAKER of North York a series of five questions were covered on the general topic of "MISCELLANEOUS WATER WORKS PROBLEMS."

I. "What has been the nature of claims for damages made against your water works system for flooding due to broken mains?

A. U. SANDERSON, Toronto, Ont., stated that there had been few claims due to flooding from broken mains but the city is not liable unless it can be proved negligent. There are some claims for property damage but these are reviewed by a City Claim Commission which can settle anything up to $500.

R. Y. DORRANCE, Montreal, P.Q., reported several major breaks in transmission mains. In many cases damages had to be paid. Small breaks are attended to by the water department. The department does not carry insurance.

WM. D. HURST, Winnipeg, Man., stated that most of their claims were for flooding. Last year there were 313 breaks and in the last few months there have been 30 potential claims. When breaks occur, the water department cleans up as much as possible, then a claim department of the utility assesses damage. This is followed by a medical health inspector. The claims are classified as: Foundation; Food, merchandise, laundry, etc.; Landscapes, roads, sidewalks, etc. The department pays the claims, and carries no liability.

W. E. MACDONALD, Ottawa, Ont., cited a case where a hydrant break flooded a haberdashery. No negligence was proved in the court case which ruled no legal liability but moral obligation. The water department paid $200.

A part of this general question dwelt with insurance policies for covering such claims. W. L. McFAUL, Hamilton, Ont., carries insurance at a 50 per cent premium of the claims. G. H. BAKER, North York, cited a claim paid for $5000. The insurance policy does not include roads or sidewalks. I. P. MACNAB, Halifax,

P.Q., stated that his department carries insurance but that it doesn't cover every claim. The insurance company only pays when the commission is legally liable.

2. "How much has the cost of water increased in the past five years?"

I. P. MACNAB, Halifax, stated that operating costs per 1000 gal. had risen from 11.4 cents in 1946 to 17.6 cents in 1949. These increases have been met by an increase of 40 per cent in rates.

A. L. MCPHAIL, St. Catharines, Ont., has one of the lowest operating costs in Canada. The total operating cost, however, has increased from 3.33 to 4.68 cents per 1000 gal.

3. What planning is necessary to make conversion of a plant from 25 to 60 cycle power to prevent stopping of operations?

RON HARRISON, Scarborough, Ont., said his utility was the guinea pig. A plan was worked out two weeks in advance and both power sources were maintained during the entire changeover. Most motors were rewound, but there were delays in some rewinding and standby gasoline or diesel driven pumps were used. After the change in power, the pumps had to be changed too, because of the greater rpm. It costs about $3.50 to $7.50 (for the large motors) per horse power per motor to make the changeover. Gasoline engines had to be changed over to Diesel to match the higher rpm. of the 60 cycle motors.

4. What is the best method for charging for industrial fire protection?

J. E. TECKHOE, Galt, Ont., suggests an annual charge for each hydrant. There are no uniform charges in his city, but they are arrived at by negotiation with the individual company. Where sprinkling systems are used, there is no charge, but a meter is put on the service.

W. L. McFAUL, Hamilton, Ont., reviewed the situation in his city where water rates are based on flat rates and three metered rates. The flat rate is due for an increase. Fire protection rates are $10 per hydrant.

J. CLARK KEITH, Windsor, Ont., said that his department charges an assessment of 1½ mills to each property owner, and charges the city $81 per hydrant. This rate is not applied to industry but Mr. Keith believes there should be a charge for private fire protection. Fire lines in factories carry meters. Industrial establishments can write off the cost in lower fire insurance rates, therefore should pay for protection. Windsor renders bills against the owner of the property and these become a lien against the property.

Photos by D. K. Galloway, Industrial Pictures, Toronto

A.W.W.A. President, Seven Past Presidents and Hosts

Front Row—Harry E. Jordan (1935) Exec. Secy. A.W.W.A., New York City; Linn H. Enslow (1949) Editor, Water and Sewage Works, New York City; Ross L. Dobbin (1932) Gen. Mgr., Utilities Commission, Peterborough, Ont.; Dr. A. P. Black (1950) Head, Dept. of Chemistry, Univ. of Florida, Gainesville, Fla.; Samuel F. Newkirk, Jr. (1945) Engr. and Supt., Bd. Water Comm., Elizabeth, N.J.; W. W. Brush (1929) Editor, Water Works, Engineering, New York City; Norman J. Howard (1941) Dir. Water Purification, Toronto, Ont.

Back Row—L. R. Howson (1942) Consulting Engineer, Chicago, Ill.; Nicol MacNicol (Chair. Can. Sect.), Comm. Pub. Wks., Forest Hill, Ont.; Dr. A. E. Berry (A.W.W.A. Vice Pres. Elect.), Director, San. Engr. Div. Ontario Ministery of Health, Toronto, Ont.; W. E. MacDonald (A.W.W.A. Dir. from Canada Sect.), Engr., City Water Dept., Ottawa, Ont.

Water Storage Needs

The guided discussion on water storage was conducted by W. D. HURST, City Manager, Winnipeg, Man.

Exec. Comm. Members

I. P. Macnab
Gen. Mgr.
Pub. Serv. Comm.
Halifax, N. S.

W. T. Randall
Pres. & Gen. Mgr.
Neptune Meters, Ltd.
Long Branch, Ont.

1. What percentage of storage do you have in relation to average and maximum days' consumption?

O. H. SCOTT, Beleville, Ont., has 33 per cent of the normal storage and 25 per cent of maximum days consumption, while C. T. HEENEY, Ottawa, has only 6 mgd. storage below the filters while the consumption averages 25 mgd. and reaches a peak rate of 43 mgd. Ottawa is planning elevated storage to make up the deficiency. They will have two 750,000 tanks and one 500,000 gal. standpipe, plus a 24 mil. gal. reservoir.

M. PEQUEGNAT, Kitchener, Ont., has an average consumption of 5 mgd. and a maximum of 7.5 mgd. Elevated storage capacity is 1.5 mil. gal.

2. How is storage distributed between filter plant, elevated storage, and underground storage?

ROSS DOBBIN, Peterborough, has 2 mil. gal. storage at filter plant and none on the distribution system. This volume is equivalent to 1/3 of the daily consumption.

G. H. BAKER, North York, reported 7 per cent storage at the filter plant, 25 per cent in elevated tanks, and 68 per cent underground. The total is equal to approximately one day's supply.

3. What do you consider an adequate water storage facilities for ground water supplies?

G. H. BAKER, North York, stated that his community is building 5000 houses a year and his storage is decreasing rapidly. He would like to have one day's supply.

4. What factors influence storage at filter plants and what is a satisfactory amount?

WM. STORRIE, Cons. Engr., Toronto, Ont., stated that the basic principle is to provide sufficient storage to allow filter rate operation at a uniform rate.

5. What is a reasonable yield from a watershed and what amount of storage is needed for a surface water supply?

MR. STORRIE stated that it depends on needs; the dependable yield is never really known. The reasonably dependable yield should be estimated, compared to the requirement and the storage calculated accordingly.

G. H. Strickland
Supt. Filt.
Util. Comm.
Windsor, Ont.

F. V. H. Piper
Director
Water Dept.
Niagara Falls, N.Y.

Programmers

A. L. McPhail
Supt.
Water Dept.
St. Catharines, Ont.

T. J. Lafreniere
Chief Engr.
San. Eng. Div.
Min. of Health
Montreal, Que.

E. M. Jones
V.P. & Gen. Mgr.
Simplex Valve & Meter Co.
Philadelphia

U.S. Mtrs. Representatives

E. A. Sigworth
Wat. Pur. Div.
W. Va. Pulp & Paper Co.
New York City

Small Plant Problems

1. What is the practice in making connections from the main to the property line?

Several speakers replied that it was common to assume that the main was in the center of the street and the owner charged accordingly.

2. What records are kept of valves, curb boxes, mains, services and hydrants?

M. W. ROGERS, Carleton Place, Ont., gave the opinion that it was important to locate and keep records of everything.

3. What is the depth of frost penetration and how often are hydrants tested in winter?

Several speakers reported frost penetration of six to seven feet; 6 ft. 6 in. cover is used. Electrical thawing is used on hydrants and hydrants are inspected on regular schedules especially in the downtown areas. In Windsor where frost penetration is only 3 ft. a cover of 5 ft. is used. J. CLARK KEITH of Windsor reported that the hydrants are checked weekly, and painted at two year intervals. (It costs 62 cents per hydrant for painting.) The hydrants are color coded according to the size of the main.

R. H. MARTINDALE, Sudbury, uses regular inspection and paints his hydrants a brilliant red.

Modern Processes in Water Clarification

"MODERN WATER CLARIFICATION PROCESSES" by Geo. H. Strickland, Supt. of Filtration, Utilities Comm., Windsor, Ont.

Mr. Strickland presented a review of modern methods of water preparation for clarification and filtration which incorporated opinions taken from replies to 60 questionnaires. In the matter of choice of most effective and economical chemical conditioners and coagulants, Mr. Strickland said that it was a matter of making the choice based on tested performance in the particular water and particular plant. He stressed that comparisons he made on the basis of the cost per million gallons and *not* the cost per ton for the chemical. In the matter of chemical feed, dry feed machines with *gravametrically* controlled feed are preferred to volumetric feeders.

As to rapid mixing and flocculation, so much in the way of economy hinges on the most effective flocculation process that many dollars can be expended in experimentation and perfection of the mixing and flocculation process and for equipment. Often, old plants can be modernized in respect to preparation of raw water by the installation of modern mechanical flocculation devices at the expense of the clarification period with overall advantages. Beyond the matter of coagulation of turbidity and color effective flocculation plays an important part in taste and odor removal, with added economy.

Sedimentation (clarification) basins should provide no less than 2 hours of theoretical detention and the velocity of flow should not exceed 3 ft. per minute. It is an advantage to have some floc reach the filters, reported Mr. Strickland, (apparently from the questionnaires) but this opinion is not shared by a great many who believe that filters should be loaded as lightly as practicable with suspended matter or bacteria, and operated as long as possible between washings and at rates of 3 to 4 gals. per sq. ft. if the applied water is properly conditioned.

As to sludge removal from the clarification basins, Mr. Strickland emphasized the advantage of mechanical sludge removal which not only maintains a more effective basin volume for clarification, but also removes taste and odor breeding material from contact with the water passing through the basins. Mr. Strickland also cited the frequently observed advantages of raw water chlorination in improving coagulation, clarification, filter performance, and condition of the filter beds as well as permitting higher rates of filtration with greater safety all around.

Chlorine Dioxide in Chlorination

"CHLORINE DIOXIDE EXPERIENCES AT NIAGARA FALLS, N.Y.," by Fred H. Piper, Director of Water, and J. J. Burnett, Chemist, Niagara Falls, N.Y.

Mr. Piper presented an interesting and illuminating review of the history and performance of Chlorite (Chlorine Dioxide) treatment at the Niagara Falls Filtration Plant which has been in use at this plant since 1945. Interestingly, this same plant was the first to apply chlorine gas by the Ornstein Process.

Mr. Piper related the many trials of pre-chlorination with chlorine dioxide in comparison with chlorine dioxide to the filtered water only, and the conclusions reached. One matter proven is that, on the basis of chlorine equivalent, chlorine dioxide is as effective in sterilization as is chlorine itself. In every instance, however, the value of pre-chlorination over post-chlorination was demonstrated.

Concerning economy, it is least costly to employ pre-chlorination, avoiding free residual leaving the plant, and utilize chlorine dioxide treatment as the effluent treatment. After five years of experience with the treat-

ment the N.Y. State Dept. of Health considers it dependable at Niagara Falls. The chief consideration at Niagara Falls has been the hazards of secondary taste production out in the distribution system. It is imperative to prevent more than 0.05 ppm. *free* residual from entering the distribution system where tastes will develop apparently due to reaction between the chlorine and the old tubercules and deposits in the system, more particularly in the dead-ends.

The Larger Meters—Their Maintenance

A topic for one of the Guided Discussion periods was "Installation and Maintenance of the Larger Meters," under the guidance of IRA MACNAB, Genl. Mgr., Public Service Comm., Halifax, N.S. who opened the discussion by commenting that the mains of Halifax considered to be too small in 1913 were today ample for 3 times the 1913 population. The answer was meterization of the system beginning in 1913.

The following was developed in the discussion.

D. M. HANNA, Supt. Distrib., Windsor, Ont., felt that the crest or venturi type meter is more accurate than disc meter for high flows. If these larger meters cannot be located in the building served, because of economy, it should be located at property line.

R. H. MARTINDALE, Supt. at Sudbury, Ont., reported that Sudbury's large meters are installed in vaults outside of the customer's property. Frost protection is provided by a wooden cover 2 to 3 feet down in the vault which is equipped with two section-hinged covers with tight fit. Meters are installed with Victanlic couplings for ease in removal and replacement. Drainage of vault is important. As to maintenance and testing, detailed records are essential and are kept on color code cards. Commercial meters are tested at 2 yr. intervals—some every year. Ledger cards show readings for 2 yr. periods.

F. Y. DORRANCE, Chief Engr., Montreal Water Works, reported that large meters are installed in customers building by preference. Meters up to 8 in. size are tested in meter shop.

J. C. STREET, Mgr. Water Utility, Welland, Ont., reported testing in shop only, but hopes to start field testing as soon as equipment is secured. Meters 6 in. or larger are tested annually by volumetric method in shop. 2 to 6 inch meters are only tested every second year in shop.

J. W. CHURCHILL, Office Mgr., Halifax, N.S. stated that meter reading records must be kept up to date if you wish to collect with least difficulty. Complete history of each meter is highly important and testing on low flows (volumetric check) is more important than testing on higher flows. Large meters are mostly checked in place yearly if not more often. Repairs are made in the field as far as possible. A service charge of $240 per quarter is made on 6 in. meters and more or less than this on larger and smaller meters.

W. E. MACDONALD, Water Works Engr., Ottawa, reported a planned testing program for all size meters, based on the quantity of water passed by the meter rather than on service periods.

A member suggested a waste valve on the meter bypass between the shut off valves, in order to be able to check the tightness of the two valves.

Lloyd Knapp Named City Engineer of Milwaukee

Lloyd D. Knapp, superintendent of sewers, has been appointed City Engineer of Milwaukee, succeeding J. P. Schwada. Announcement of the appointment was made by Mayor

Zeidler April 17th when Dr. E. Krumbiegel was re-appointed City Health Commissioner and Walter M. Swietlik was re-appointed Commissioner of Public Works. John W. Toughe continues as Deputy Comm. of Public Works and Supt. of Water.

Mr. Knapp has been in the service of Milwaukee for almost 25 years, 20 of which he has been in the City Engineer's Dept. For the past 5 years he has been Supt. of the Bureau of Sewers.

It is understood that J. P. Schwada, former City Engineer for many years, is to be appointed to the recently created post of engineer-coordinator of the civil defense and disaster committee.

Operation of Los Angeles Treatment Plant to Cost $1,287,845 Per Year

The new activated sludge sewage treatment plant of Los Angeles now nearing completion at a cost of $41,000,000 will according to budgeted estimates cost $1,287,845 to maintain and operate the first year of service.

When the plant is placed in full operation it is said that 245 employees will be required to man and operate the plant.

It is estimated that the sale of sludge as fertilizer will produce an income of $210,000 and cut the net cost of operating the plant to something more than $1,000,000, which is causing the mayor and the Los Angeles City Council considerable pain. A possible investigation into the cost of the plant and operating budget is threatened by Mayor Bowron.

On top of the one and a quarter million dollar operating budget set up, it is proposed that the firm of Metcalf & Eddy (Boston) designers of the plant, be retained to place the plant in operation and supervise operation the first year for a fee of $144,000.

AWWA Specifications Available

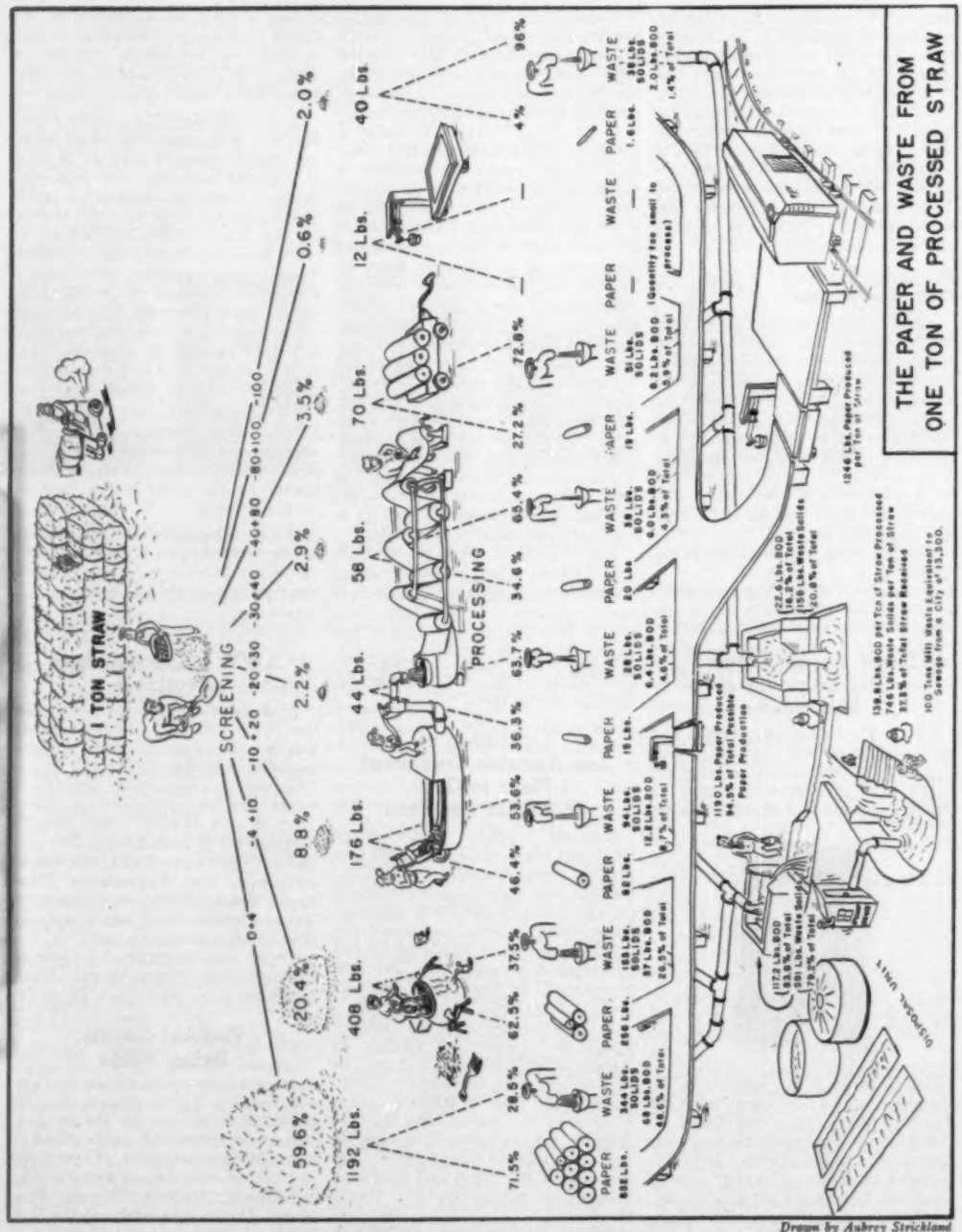
Announcement has been made by the AWWA Office in New York City that two official specifications are now available in booklet form. The first is "TENTATIVE STANDARD SPECIFICATIONS FOR INSTALLATION OF CAST-IRON WATER MAINS" which may be obtained for 35 cents a copy. The second is "TENTATIVE STANDARD SPECIFICATIONS FOR REINFORCED CONCRETE WATER PIPE-STEEL CYLINDER TYPE, PRESTRESSED" which may be obtained for 20 cents a copy.

Copies may be obtained by writing the American Water Works Assn., 500 Fifth Ave., New York 18, N. Y.

Federal Grants Being Made

Recent news releases from the General Services Administration have reported Federal loans for the preparation of drawings and specifications to some 140 municipalities. These loans are interest free, and are authorized by the Second Advance Planning Program. They are repayable to the U.S. Treasury when construction begins.

Among the projects for which loans were made are sanitary sewers and treatment plants, storm sewers, and water works involving storage dams and treatment plants. More than sixty projects are included in the water and sewage works category.



A TECHNICAL STORY IN PICTURES *

Utilizing the "comic book" technique, the above "cartoon" shows a flow diagram of a Strawboard Mill and the industrial waste "From One Ton of Straw."

From the drawing, it is possible for the reader to readily grasp the problem involved. It has been said that, "a picture is worth a thousand words." The above drawing which occupies a space equivalent to about a thousand words, has been prepared with that comment in mind. Perhaps this technique may be applied to the story of other industrial waste problems.

*Reproduced through courtesy of Don E. Bloodgood., Prof. Sanitary Engineering, Purdue University.

UNIQUE FLOTATION UNIT FOR INDUSTRIAL WASTE TREATMENT*

Its Development and Use for Soap Waste Treatment

by

F. S. GIBBS
President
F. S. GIBBS, INCORPORATED
BOSTON, MASS.

TO become involved in industrial waste water treatment problems is not conducive to peace of mind and fireside contentment. It spoils clothes, rots shoes, smears one's face, blackens fingernails, perfumes one's hair, cools one's meals, ruins sleep, and makes one's wife wonder why she ever was foolish enough to marry an engineer. The best way to become so involved is to visit or work in treatment plants when they are experiencing operating difficulties and then try to dream up better means for accomplishing their purposes.

Clarification Problems

Industrial waste treatment difficulties frequently include inabilities to effect efficient clarification continuously and to produce workable sludge consistencies. Light weight, stubborn suspensions frequently resisted settling. Oils, fats or greases in waste waters produce low quality plant effluents. Varying influent temperatures create upsetting themal currents causing sludge to flow into zones of effluent discharge. Varying influent rates have a similar destructive effect on effluent quality. Come clarification equipment is unable to operate efficiently at rates greater than one half or one third of their designed capacity. Often sludge cannot be concentrated to filterable consistencies. Large volumes of thin sludge create disposal problems and septicity of sludge in long period clarification retention destroy effluent quality.

The Author

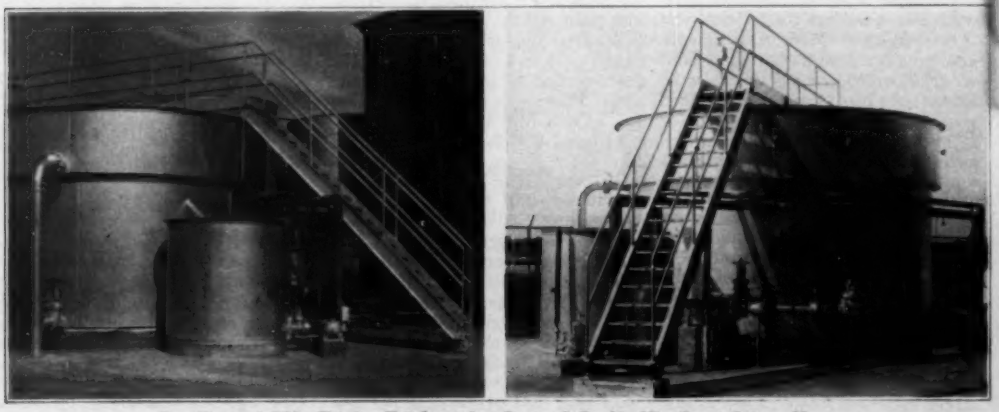
Operating difficulties such as the above indicate that gravity settling clarification and sub-aqueous sludge formation are not suited for many wastes treatment problems. In some installations, despite costly chemical applications and expensive clarification equipment, the settling balance was observed to be so delicate that it was often impossible to maintain satisfactory clarification efficiencies and workable sludge consistencies. It seemed to us that the answer to these problems was to find means to tip the balance in the other direction; means for reversing the usual procedures; means for obtaining clarification by moving suspensions to the liquid surface where they could be removed as a floating sludge.

Principles of Flotation

The basic principle in flotation is to reduce the specific gravity of the suspension particle to less than the specific gravity of the liquid vehicle. This is accomplished by the attachment of particles of low specific gravities to the suspension particle until the total specific gravity of the combined volume is less than that of an equal volume of the liquid vehicle. Obviously, air, or other gas, has the ideal characteristics for reducing the specific gravity of suspension particles.

The problem is to control the size of the gas bubble in the liquid vehicle so that numbers of the bubbles will be attracted to and adhere on the surface of the suspension particle. When a sufficient number of bubbles are at-

*Presented before the 5th Purdue Industrial Waste Conference and here published by permission.



Two Views of Gibbs Flotation Unit Located at Procter & Gamble Mfg. Co. at Quincy, Mass.

tached to the suspension particle their lifting power will move the suspension particle to the liquid surface even under conditions of counter-current liquid flow. The prime requisite is that the gas bubbles must be smaller than the smallest suspension particle.

Bubble Size Studies

Several ideas for accomplishing the formation of infinitely small gas bubbles were studied. We learned how to create infinitely small bubbles in comparatively few members, but when we attempted to increase the numbers of the bubbles, agglomeration took place and the bubble size increased many times. These larger sized bubbles were practically worthless for the flotation of suspensions. Many experiments were conducted with the liquid flow in transparent piping, and with lighted sight glasses in a flotation tank in efforts to learn why the bubbles agglomerated when their numbers were increased. This experimental work resulted in the development of methods and apparatus which allowed wide flexibilities in the formation of large numbers of bubbles without increasing their size. The requirement for delicate balance and control of the gas inlet was eliminated.

The next step was to adapt the bubble formation design to a complete flotation system which would include equipment for the removal of floating sludge under conditions of continuous flow.

Pilot Studies on Paper Wastes

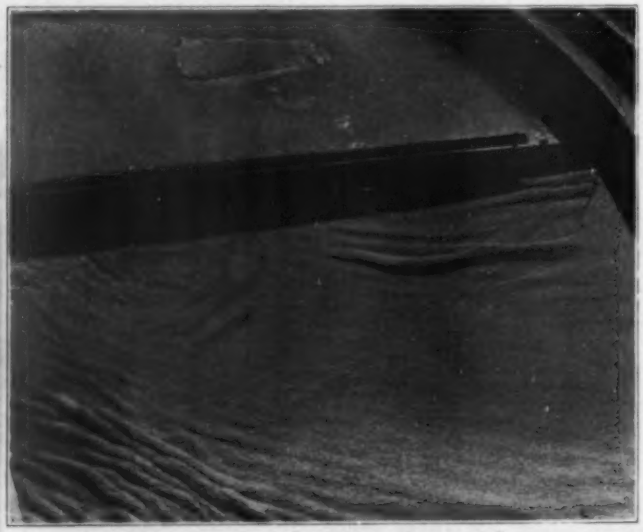
A rather ambitious pilot plant was designed and constructed. The flotation zone was four feet in diameter and ten feet deep, allowing continuous flows to 50 gpm. When the fabrication was completed, the pilot plant was tested with continuous flows of city water containing induced floc suspensions for the purpose of checking the sludge removal designs. The flotation of the floc suspensions produced a stable floating sludge, but the sludge removal design was a failure. Four different sludge removal designs were constructed and tested before a successful one was found.

Following the preliminary tests, the pilot plant was moved to a paper mill in Western Massachusetts for experimental work on white water wastes. It was installed at the point of white water discharge taking continuous flow from a Bird saveall.

At times the pilot unit would produce good results but the good results could neither be maintained nor reproduced with full control. The good results that were produced provided the encouragement to stick with it, and we did for nine weeks. The "good" results included 93.5 per cent efficiency in the removal of fibre and filler (incidentally, in the same proportions as they existed in the white water) with an average sludge consistency of 6.7 per cent dry solids.

At least half of the time the pilot plant was shut down for making changes. We learned how not to build a pilot plant and uncovered many of the unit's inadequacies. It was decided to move the unit back to Boston and do a major job of rebuilding.

Back in the shop, the rebuilding ideas developed to such awkward proportions, it was decided to junk the entire pilot plant and start from scratch in building a second unit. As this work neared completion, commitments were made to conduct pilot studies of wool scouring wastes and soap manufacturing wastes.



Floated Sludge Removed by Rotating Skimming Blade
(The sludge collects during 15 minute rotation period. Approximately 1½ in. thick it has dewatered to the point of cracking.)

Pilot Studies on Wool Wastes

Following completion of the fabrication of the new pilot unit, and preliminary hydraulic tests, the unit was moved to a wool scouring plant in Eastern Massachusetts. There it was installed adjacent to the wool scouring wastes discharge to the lagoons. The wastes were pumped to a sand trap from which the flow was directly to the pilot unit.

Pilot operations on wool scouring wastes were continued for eleven weeks, with our engineers operating the pilot unit continuously 24 hours each day. We had much to learn and further changes to make. The results produced were gratifying. Despite considerable difficulties in chemical application and control, the pilot unit produced efficiencies of more than 90 per cent in the removal of usupensions and sludge consistencies above 7 per cent dry solids. It is interesting to note that the pilot unit removed all of the B.O.D. in suspensions, and averaged approximately 20 per cent removal of the B.O.D. in solution.

Though the wool scouring wastes studies were not absolutely conclusive, they vindicated the pilot designs for the removal of difficult suspensions and the concentration of sludge. We looked forward to the waste studies at the soap manufacturing factory where the management had a sincere desire to eliminate the pollution caused by the wastes.

Pilot Studies on Soap Wastes

Following a few minor, but important, changes, the pilot plant was moved to the soap manufacturing factroy. It was installed in the soap processing plant, and the pilot studies were conducted from October 1948 to February 1949. The pilot plant was maintained in nearly continuous operation throughout that period, with our chemical engineers conducting the studies. The soap manufacturing company engineers and chemists gave us wholehearted cooperation, assistance and encouragement in our work.

In soap manufacturing, the waste waters discharge into trap tanks or

skimming basins. The purpose of these tanks is to provide trapping, for recovery, of easily floatable fatty acids. Our work included pilot operation on trap influent as well as trap discharge. We experimented with and without chemical applications. The pilot influent flow was maintained at various rates. All possible ranges of pilot recirculation rates, air intake quantities, adjustable weir settings, agitation retentions and power input, etc., were tried. All operating data were posted every thirty minutes in master log sheets. Graphical representation was utilized to learn the relationship of the operation data and results obtained.

It was agreed with the soap manufacturing engineers that on each test run, the pilot plant should be operated continuously for at least 24 hours, with pilot variables held constant for that period. Thus, fairly accurate data were accumulated on the results under varying conditions of soap processing. Analyses were made hourly of the pilot plant influent and effluent, and correlated with the soap processing operations and the pilot plant data.

When the pilot plant studies established the optimum rates, retention and methods best suited for the removal of fatty acids and soaps from the waste waters, the pilot operation was continued unchanged for a few weeks. During this period the soap manufacturing engineers altered standard processing procedures to produce wastes conditions of dilution, concentration, high and low temperatures, and other abnormal, but possible, operating conditions. The pilot plant effluent continued consistently good throughout the most exacting of the latter test runs. During a part of the test period the effluent was piped directly into tidal water so that any effect of cold sea water could be observed.

At times the pilot effluent and trap effluent were discharged in parallel into tidal water for direct comparison. The pilot effluent chemical analyses checked the visual observations on the removal efficiencies. Sludge samples were analyzed for fatty acids content and consistency. Sludge samples were acidulated, for conversion of soaps to fatty acids, and then the recovered fatty acids were reprocessed.

Full Scale Plant Designed

The extended pilot plant studies had proved that the methods and apparatus were sound, and gave promise of some measure of success when expanded to full scale design and operation. The many problems involved were worrisome because it was impractical to utilize the simple and direct factor of capacity rating when designing the actual plant. Available textbooks and established formulae could not provide dependable answers. The pilot plant design and operating experience guided some arbitrary decisions on parts of the full scale design.

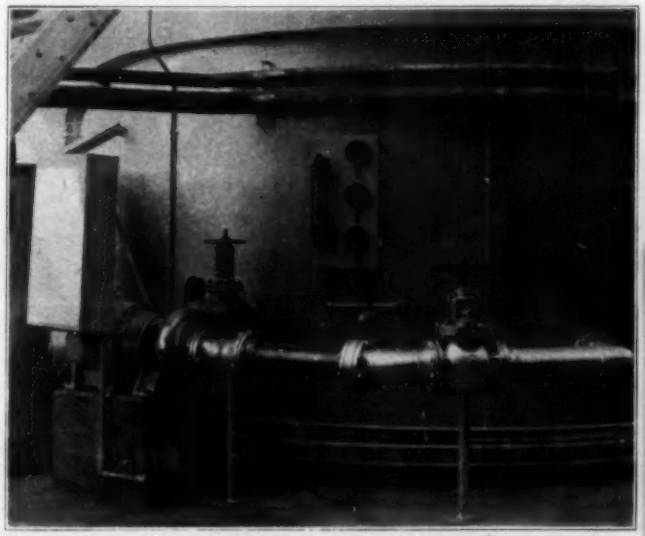
When the final plant designs were completed, they were discussed at length with the soap manufacturing company officials and engineers. These officials and engineers were thoroughly aware of the unanswered questions involved in the expansion from pilot to full scale, but they were confident that it offered the best chance for the solution of their plant wastes problem. Authority was given to proceed with fabrication and installation of the treatment plant equipment.

Fabrication and Delivery

The procurement of the auxiliary equipment and the fabrication of the recovery unit proceeded smoothly.

Before starting the shop work, we investigated the possibility of shop fabricating the unit and transporting it over the road from the James Russell Engineering Works in Dorchester, Mass., to the Procter & Gamble factory in Quincy, about five miles away. Permissions were obtained from the City of Boston, Metropolitan District Commission, and Quincy police departments for transporting the unit providing it be moved between the hours of 4 A.M. and 5:30 A.M., and be accompanied by police escorts. The unit dimensions of 12 ft 8 in. high by 19 ft. 8 in. over-all diameter did not present any trolley wire or underpass problems.

One of the accompanying photographs shows the shop fabricated unit on a heavy duty trailer at the James Russell Engineering Works. The trailer was loaded in the afternoon so that all would be in readiness for the early morning departure. Since a portable crane was needed to place the unit on its foundation, the crane was used to lift the unit over the factory gate. (Shown in the photograph.) A simple concrete base was provided for the unit.



Recirculation System for Flotation Unit

(Suction from the clarified water zone is at the right. Air inlet is through a ¾-in. pipe connection in a special flange between the Monel metal spool piece and the 45° elbow. The pump discharges into the flotation zone. The two horizontal covered lines are the steam line to the sludge receiving tank and the steam traced sludge return line to the processing plant.)

Our engineers supervised the installation of the recovery unit and its auxiliary equipment. The work was done with all possible speed because the soap company was anxious to reduce the pollution of the bay receiving the plant waste water.

Operation Begins

In addition to the main recovery unit, the treatment plant equipment included a chemical mixing tank with agitator, and automatic pH measurement of the waste water with automatic control of the chemical feed.

Floated Sludge Being Discharged into Sludge Receiving Tank
(The tank is heated with a steam coil to facilitate pumping of the sludge back to the manufacturing process.)

The installation work progressed to the point where everything was finished with the single exception of the electrical wiring for the pH transmitter and recorder-controller. It was indicated that two or three days work would be required to complete the wiring.

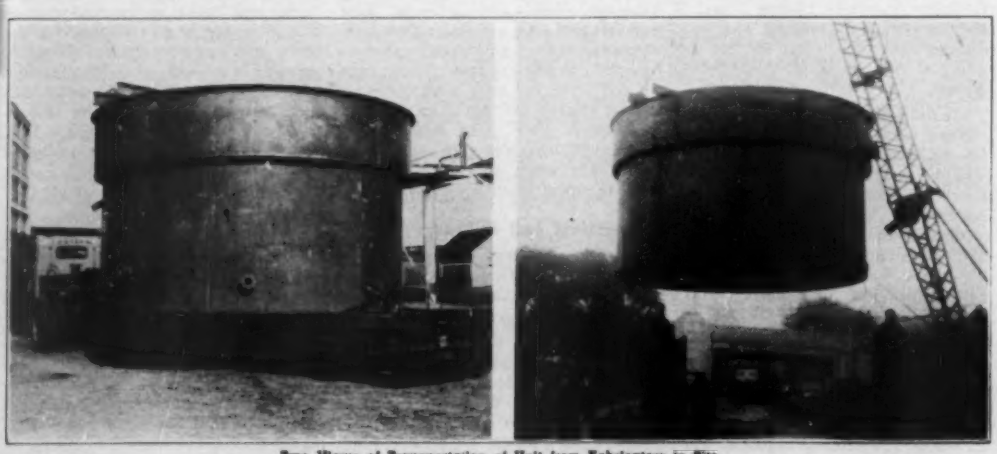
The summer season was in full bloom. The plant waste waters were creating unsightly conditions in the bay and surrounding waters. At this point, a few days delay in starting the treatment plant were grumbled at by all concerned.

It was agreed that starting the treatment plant operation with manual control of the chemical application could certainly do no harm, and it should do some good in alleviating the bay pollution. The treatment plant by-pass was closed and the wastes flow directed into the recovery unit which had previously been filled with clean water. The chemical application was placed in operation with an arbitrary setting of the feed control valve. The recovery unit recirculation pump was started, with the atmospheric air inlet opened wide.

Since the success of the treatment plant depended on the production of large volumes of infinitely small air bubbles, and their equal distribution throughout the flotation zone of the unit, the major unanswered question was about to be answered in a very few seconds. The second question, of nearly equal importance because of its bearing on the successful concentration and removal of sludge, was the ability of the unit to provide full hydraulic control of the wastes flow.

The first few seconds of recovery unit operation eliminated the fears of anxiety. The full scale unit produced smaller bubbles than had been seen in the pilot unit, and produced them in considerably greater volume. Distribution of the air bubbles was perfect. Observations, of the bubbles size, volume and distribution, were soon obscured by the suspended solids and fatty acid globules which moved to the liquid surface and there formed an opaque sludge. Within a few minutes a heavy floating sludge had formed. The sludge removal mechanism was placed in operation. Sludge concentration and removal operated with equal efficiency and gave full vindication of the hydraulic control design.

The initial rate of wastes flow gave a total unit retention time of approximately forty minutes. At the end of forty minutes of operation, the unit effluent was expected to change from clean water (from the original filling) to waste water containing some portion of the contaminants. The effluent



Two Views of Transportation of Unit from Fabricators to Site
(Left—The unit on a heavy duty trailer. Right—Unit being lifted over the factory gate by portable crane. Permission to transport through the streets stipulated moving between 4 and 5:30 a.m.)

continued clear to visual examination. Close observation of the area of effluent discharge in the bay showed no evidence of fatty acids and soaps going overboard. The wastes treatment plant, despite the difficulties of manual control of the chemical application, was doing its job. The pollution of the bay and the surrounding waters was ended.

Automatic Control

Automatic pH control simplifies chemical application, reduces chemical waste, and eliminates the personnel attention necessary to manual control.

The first weeks of treatment plant operation were devoted to close observation of the recovery unit and continual sampling of the influent, effluent and sludge to determine efficiencies. Influent rates changed frequently and the character and temperature of the wastes varied, but the unit operation and efficiencies held constant.

Various air volumes and recirculation rates were studied to determine the extent of possible overdesign. The sludge removal mechanism was operated both continuously and intermittently. A wide range of pH adjustment was tried to learn the unit flexibility. It is indicated that the recovery unit can be depended on to produce excellent efficiencies under all possible conditions of waste flows and character, with infrequent and low cost maintenance requirements.

Operation Data

Air is introduced into the system at 5.5 cfm under a 13 in. (Hg) vacuum. The pH of the waste is maintained at 6.1 to 6.3 by the addition of 10 per cent line slurry. Wastes before treatment contain approximately 300 ppm. of undissolved fatty acids. The effluent contains approximately 10 ppm. Thus removal efficiency is greater than 96 per cent.

The unit operates at an overflow rate of 3 gal. per sq. ft. per min. which means an effluent weir loading of less than 12 ggm. per foot of weir length total weir length, 55 ft.).

The sludge removal skimmer operates at a rate of one revolution in 15 minutes. The sludge removed to the sludge tank (6 ft. dia. x 6 ft. deep) contains approximately 18 per cent dry solids. It is heated by steam coil before pumping back to manufacturing processes. The net value of the recovered sludge is approximately $1000 per month, enough to pay operation costs and amortization of capital investment.

Milky Water

When the customer draws a glass or pitcher of water and it is milky when first drawn, and gradually clears, this condition is due to supersaturation of the water with air and oxygen.

In some manner air has gotten into the water through leaking pump glands, air drawn into the suction line or even because the water being chilled dissolves more air (oxygen) than it can retain in solution at a higher temperature as when pressure is released upon being drawn from the tap.

Upon being drawn from the tap exceedingly fine bubbles of air are released and the water takes on a milky appearance when the dissolved air becomes emulsified air. These bubbles gradually coalesce into larger bubbles and escape. This phenomena is more prevalently observed when the water is very cold and becomes warmed up in the house piping system. The customer is more apt than not to blame this condition on "those chemicals that they put into the water."

"The Song of Soft Water!"
(Courtesy the Canadian Section)

UNIV. OF FLA. DEDICATES CHEMISTRY BUILDING

Leigh Hall—Approximately One-fifth of Building Shown

On April 15, 1950 the University of Florida dedicated Leigh Hall to house the Department of Chemistry and College of Pharmacy. The dedicatory address was given by Dr. George D. Beal, Asst. Dir., Mellon Institute, Pittsburgh. The building is named in honor of the late Townes R. Leigh who served as head of the department of chemistry at Florida from 1920 to 1949.

The building contains 83,710 sq. ft. of floor space of which approximately two-thirds is devoted to chemistry and one-third to pharmacy. The department of chemistry is now headed by Dr. A. P. Black, immediate past president of AWWA.

The new building includes one large central laboratory and two research laboratories for the use of students in sanitary chemistry. Two undergraduate and five graduate courses in water chemistry are offered. At the present time there are five graduate students in sanitary chemistry, four candidates for the Ph.D. degree and one for the masters degree.

THE ROLE OF AMMONIA NITROGEN IN SEWAGE TREATMENT

A Review and Comment

by
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NITROGEN present in raw sewage is generally contributed by humans in the form of urea and complex nitrogen compounds. Early work by British investigators[1] indicated that the nitrogen in domestic sewage is present in the dissolved state as ammoniacal nitrogen and in the finely divided colloidal state as compounds of protein character.

Nitrogenous compounds in sewage and their response to biological degradation may be summarized from Buswell.[2] Nitrogen is present as free ammonia which indicates the extent of hydrolysis of the nitrogen containing compounds and represents an end product of bacterial decomposition. Albuminoid ammonia, now seldomly determined, represents the ammonia attributed to amino acids and peptones. Total organic nitrogen represents the nitrogen equivalent of nitrogenous organic compounds in the various stages of hydrolysis from complex proteins to amino acids.

En route from the homes to the point of treatment, certain transformations occur in sewage. These are a direct result of conditions existing in the sewer system, and the changes will yield ammonia as a result of the hydrolysis of the urea and complex organic compounds containing nitrogen. These processes are accelerated by high temperature and anaerobic conditions induced by sewer depositions and obstructions.

As a result the ammonia in the raw influent is generally found to be greater than the combined organic nitrogen. The alkalinity is enhanced by the formation of ammonium salts. These ammonium compounds will also serve to buffer the pH of the system, and in higher concentrations, decrease the treatability of the sewage.

In a fresh, raw sewage, ammonia and alkalinity increase in the initial degradation steps which occur to a greater or lesser degree enroute to the treatment plant and often in primary tanks. These initial changes involving virtually no oxidation, yield basic products from (a) the hydrolysis of urea with the formation of ammonia. It has been established[3] that the maximum hydrolysis of urea is accompanied by a minimum oxidation of organic compounds. The urea bacteria are both aerobic and anaerobic with the majority of the organisms aerobic. These organisms function most successfully at a pH near neutral. The reaction for the formation of ammonia as the carbonate from urea may be expressed

$$(a)\ CO(NH_2)_2 + 2H_2O = (NH_4)_2CO_3 = CO_2 + 2NH_3 + H_2O$$

and (b) the hydrolysis of proteins and their derivatives.

Formation of ammonia from proteins is very active under anaerobic conditions. The rate of ammonia accumulation from proteins is that of an auto-catalytic chemical reaction. This means that the maximum rate of formation occurs when the total amount of transformation is half completed. The type of proteins present and the presence of non-nitrogenous material determine the reaction rate. As this degradation approaches completion, ammonia and alkalinity contents approaach a maximum.

Importance of Ammonia

Ammonia nitrogen plays a vital role in the biological treatment of domestic sewage. It serves as a source of nitrogen for the microbial oxidation of the carbonaceous compounds and is itself oxidized to nitrites and nitrates.

As a domestic sewage undergoes progressive oxidation the carbonaceous compounds are most readily attacked and as the oxidation of these compounds proceeds, ammonia or organic nitrogen is utilized for the structural metabolism of the organisms. The extent of decomposition of the carbohydrate depends upon the nature of the active organisms and upon the nature and amount of available nitrogen Consequently the greater the amount of organic carbon present the greater the amount of nitrogen assimilated by the organisms. Part of the material oxidized is reassimilated by the organisms, part is left as intermediate products due to greater resistance of these compounds to further oxidation, and part is reduced to end products. In addition, the chemical compounds present are decomposed at varying rates and to varying degrees, simple sugars first, followed by starches and then cellulose. Lignin and waxes are decomposed more slowly.

Hence for every unit of carbon decomposed as a source of energy a certain amount of nitrogen is assimilated. This is illustrated in Fig. 1.

Using ammonia as an approximate criterion, the decrease in ammonia will tend to indicate the amount of carbon oxidation when the quantity of ammonia oxidized to nitrates is deducted.[3]

Figure 2 depicts the changes in ammonia nitrogen of sewage as the sewage undergoes oxidation. These data were derived from several domestic sewages which were aerated and the ammonia changes noted with respect to time. The rapid initial decrease in ammonia may be attributed to the assimilation by the organisms active in the oxidation. The ammonia used by the organisms depends upon the C:N ratio of the organisms. Some experimental evidence has indicated that a ratio exists between the decrease in oxygen consumed and the decrease in ammonia.[3] When the carbonaceous oxidation stage is essentially complete, the oxidation of ammonia existing in the solution, and that formed from the destruction of cell structure are oxidized to nitrates. The mechanism of ammonia oxidation [3] has been indicated to be

$$2\ NH_4 + 3O_2 = 2\ HNO_2 + 2H_2O \text{ or}$$
$$2\ NH_4 + 3O_2 = N_2O_3 + 3H_2O$$

The transformation of ammonia to nitrate has likewise been found to

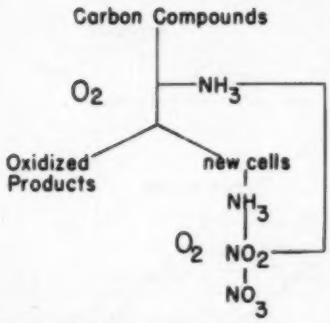

Fig. 1—Role of Ammonia Nitrogen in the Metabolism and Oxidation of Domestic Sewage

follow the auto-catalytic oxidation curve. Godlewski[3] in working with pure solutions found the ratio of oxygen consumed to nitrogen oxidized to

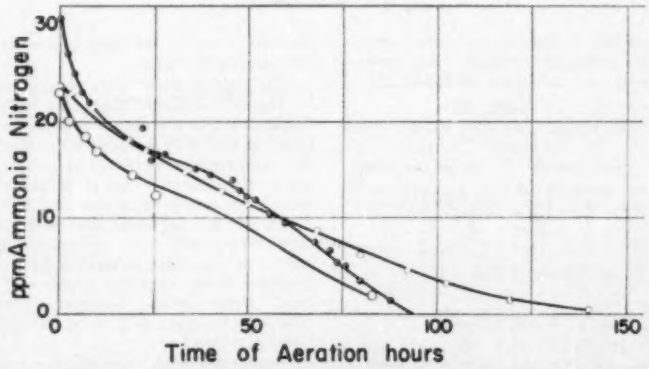

Fig. 2—Decrease in Ammonia Nitrogen with Respect to Time of Aeration in Several Sewages Oxidized at Varying Temperatures

be equal to three to one. On Fig. 3 this is indicated with respect to nitrate production and it is noted that initially the ammonia falls off very rapidly with respect to the nitrates but later when the carbon oxidation is essentially complete, it becomes a straight line and ammonia reduction is approximately stoichiometrically proportional to the nitrate production. Variations may be induced by ammonia formation from decomposing cells.

In a domestic sewage, a large portion of the alkalinity will be contributed by the basic ammonium salts. It may be deduced that while there appears to exist a relationship between alkalinity and ammonia in any one sewage undergoing oxidation, this relation will vary from sewage to sewage due to variations in the character of the sewage and the water.

Figure 4 relates the ammonia to the alkalinity in a sewage study and indicates that reductions in the ammoniacal portion of the alkalinity in the first stage oxidation are due to assimilation, which reflects the intensity of carbon oxidation in the alkalinity change. It will be noted that the relationship is similar, with or without activated sludge. In 1927 Parsons and Wilson recognized the fact that the changes in ammonia roughly paralled the changes in alkalinity.

Trickling Filters:

The importance of ammonia nitrogen as a constituent of domestic sewage in biological filter beds has been established by many investigators. Levine[6] has illustrated that ammonification takes place in the upper portions of a filter as indicated by the rise in ammonia and the decrease in organic nitrogen. As the sewage passed on through the filter, the ammonia is progressively oxidized to nitrites which are in turn oxidized to nitrates. This phenomena may be likewise illustrated by the changes in the alkalinity of the sewage as it passes through the filter bed. Experimental evidence has indicated that as a sewage passes through a filter under oxidizing conditions, the ammonia and the alkalinity are reduced in some proportion to the amount of oxidation occurring in the filter. (See Table 1.)

Early work by Mumford[2] indicated the mechanism of nitrification to be due to the oxidation of ammonium salts in several stages. He believed that hydrogen atoms were successively hydroxylated with the elimination of water from the molecule. Clark and Adams[8] found that nitrification ceases when the C:N ratio become too great.

Studies conducted at the Pennsylvania State College by Eckenfelder[9] revealed the differences between a filter which oxidized sewage and one

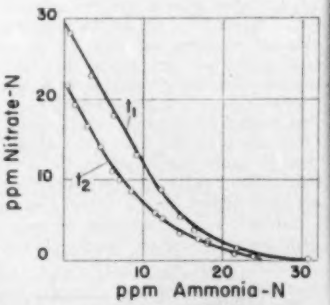

Fig. 3—Relation Between Ammonia Nitrogen and Nitrate Nitrogen by Aeration

(l_1 and l_2 represent two sewages oxidized at 9 and 19°C respectively)

Table I
DATA ON TRICKLING FILTER OPERATION

Location	Alkalinity Applied ppm.	Alkalinity Effluent ppm.	Ammonia Nitrogen Applied ppm.	Ammonia Nitrogen Effluent ppm.	Total Organic Nitrogen Applied ppm.	Total Organic Nitrogen Effluent ppm.	B.O.D. Applied ppm.	B.O.D. Effluent ppm.	Nitrate Nitrogen Effluent ppm.
Ridgewood	187	100	.....	.....	.....	.....	68	15	.....
"	176	95	.....	.....	.....	.....	85	20	.....
"	166	107	.....	.....	.....	.....	43	11	.....
"	162	102	.....	.....	.....	.....	30	9	.....
Glassboro*	132	62	9.6	0.8	0.9	8.7	88	16.8	7.14
Little Falls*	108	66	10.5	4.6	5.5	2.9	137	38	7.77
Princeton*	166	74	13.0	1.4	2.0	3.4	118	40	5.54
Washington*	144	72	25.0	12.4	17.0	6.6	251	45	10.3
Pitman No. 2*	312	114	19.0	3.3	11.0	2.7	188	25	21.0
Totowa*	108	50	6.4	2.3	3.2	2.9	92	21	3.6
West Paterson*	166	50	18	4.4	10.0	4.6	288	61	7.4
Hammonton*	70	28	9.4	1.1	0.6	7.3	150	43	8.0
Plainfield*	206	158	18.0	5.0	54.1	39.1	296	56	8.8
Bridgeton*	112	60	9.6	6.0	9.4	2.4	175	40	5.6
Moorestown*	102	68	11.0	4.2	5.0	6.3	174	57	4.3
Pitman No. 1*	198	148	11.4	4.8	12.6	3.6	206	55	6.8
Freehold*	316	108	30.0	8.0	7.5	6.0	348	57	19.8

*Data from N.J.S.W.A. Proceedings 1935

which served essentially as a nonoxidizing de-colloider; Table II.

Table II
RESULTS OBTAINED ON TWO FILTERS

	NH_3-N ppm.	Tot. Org. Nit. ppm.	pH	Alk. ppm.	B.O.D. ppm.
Raw Sewage	12	4	7.4	163	78
Filter #1 Eff.	19	1.2	7.6	164	38
Filter #2 Eff.	10	0.6	7.3	79	19

Since both filters received the same raw subject the difference between the two rested in their oxidizing ability.

Studies conducted by Forman and Shaw[7] revealed the changes in nitrogen through filters in several New Jersey trickling filter plants.

As a general rule, the organic nitrogen and the ammonia were reduced during passage through the filters with the resultant production of nitrates in the effluent.

A clear cut example of decreases in ammonia nitrogen through a biological filtration plant and the subsequent influence on the quality of the effluent is revealed at Ridgewood, N.J. These data are plotted on Fig. 5.

Activated Sludge:

The transformations in ammonia nitrogen through the activated sludge process are similar to the changes through a biological filter. In comparing the changes in ammonia through an activated sludge process aerator with respect to time, to the changes obtained by plain aeration, the principal difference lies in the fact that the recycled sludge may contain appreciable concentrations of nitrates so that enough nitrification occurs simultaneously with the first stage oxidation to cause variations in the ammonianitrate curves derived from plain aeration studies, and shown on Fig. 3.

Studies were conducted on pilot plant aerators and the results plotted on Fig. 6. Results indicating changes in ammonia through pilot aeration tanks are tabulated in Table III.

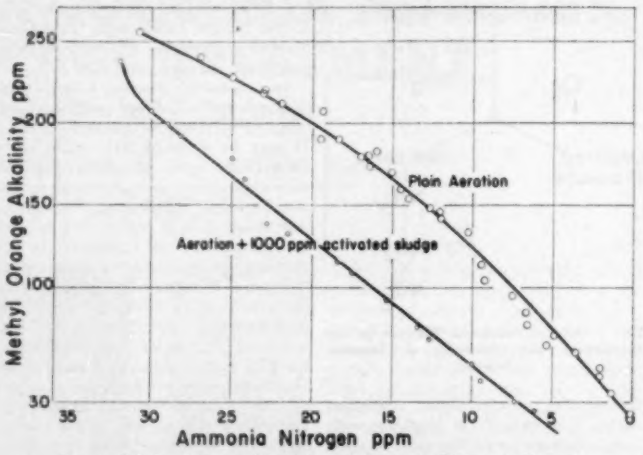

Fig. 4—Relation Between Alkalinity and Ammonia Nitrogen in Sewage
(One sewage oxidized by plain aeration and the other oxidized by aeration plus 1000 ppm. of activated sludge)

Table III
CHEMICAL CHANGES EFFECTED IN AERATION TANKS

Influent to Aerator			Effluent from Aerator			
Alk. ppm.	NH_3-Nit. ppm.	B.O.D. ppm.	Alk. ppm.	Ammonia ppm.	B.O.D. ppm.	NO_3-Nit. ppm.
212	22	150	121	9.5	7	8.3
228	21.5	239	130	7.7	24	6.8
210	20.3	83	174	15.9	....	....
200	19.7	129	161	14.4	30	4.2
180	20.7	....	139	12.3	....	7.6
200	21.9	....	130	10.0	....	6.9
232	28.5	....	182	21.2	....	2.0

Ratio of return sludge to raw feed 20% to 70%
Mixed liquor solids 1500-3500 ppm.

It will be noted that as the sewage moved along the aerator the ammonia content was reduced and the nitrate concentration increased as a net effect. Heukelekian obtained similar relations between ammonia and time in contact with activated sludge.

Work along these lines conducted by Ingols[8] indicated that very little dissimilation of the proteinaceous material in the sewage occurred during the usual aeration period. The nitrifying enzymes were found to be active only in an excess of oxygen and ammonia. He further found that zoogleal organisms must have an adequate source of ammonia to oxidize carbohydrates in the activated sludge process. Sphaerotilus, however, was found to function in a more reduced ammonia supply.

Ingols attributed the decrease in free ammonia during the aeration of sewage with pure culture activated sludge to the synthesis of new amino acids, and hence very little dissimilation of amino acids present took place during the first six hours of aeration. Extended aeration, however, produces autocatalytic destruction, as indicated by the production of ammonia. The nitrogen in the nitrate is an available source for protoplasm development while the excess ammonia is nitrified. The drop in nitrification in the winter was indicated by Sawyer and Rohlich[9] to be due to the retardation of the growth of the nitrifying organisms which is hindered by the rate at which ammonia, the source of energy can be oxidized, and also because of the inability of the sludge to hold ammonia.

In summarizing their studies on nitrogen transformations in activated sludge Heukelekian and Littman[10] state "after long periods of aeration the nitrogen transformations in the activated sludge process were the quantitative conversion of ammonia to

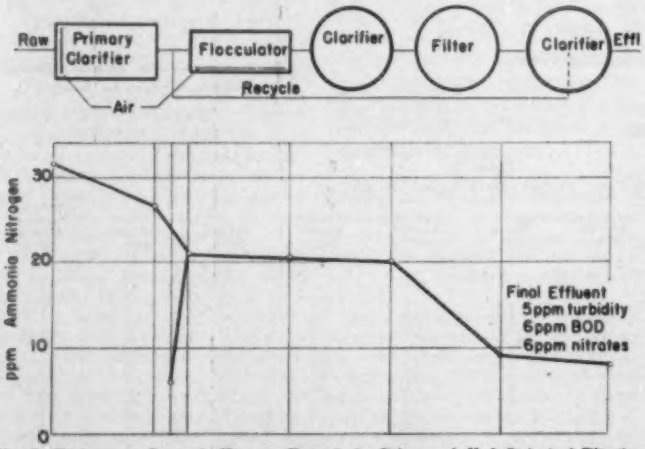

Fig. 5—Variation in Ammonia Nitrogen Through the Ridgewood, N. J. Biological Filtration Plant

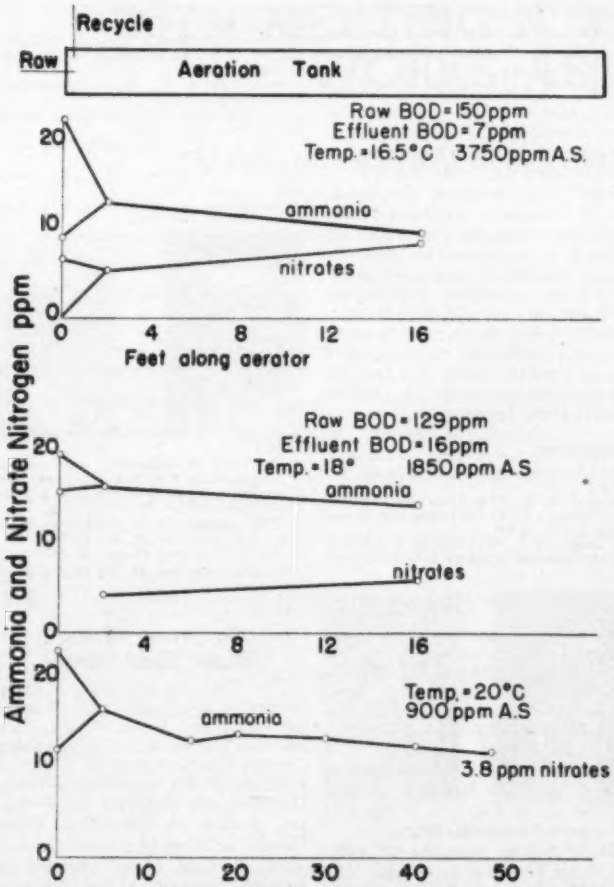

Fig. 8—Variations in Ammonia Nitrogen Through Aeration Tanks of the Activated Sludge Process

nitrates, bacterial assimilation of some ammonia and liberation into the liquor, part of the nitrogen as ammonia with periods of over-aeration and then the conversion of the ammonia to nitrates."

Sludge Digestion

Daily determinations of ammonia nitrogen present in the primary digestion tank at the Ridgewood Sewage Plant for several months in 1945, disclosed a range of concentrations from 300 ppm. minimum to 725 ppm. maximum. These concentrations were obtained by the direct Nesslerization method of determination. No ammonia of a commercial nature had ever been introduced into this tank, so that the amounts found to be present were entirely due to the transformation of proteins and organic nitrogen by anaerobic decomposition. "Some of them (proteins) are decomposed completely to ammonia. Others are partially hydrolysed to amino acids and amides. Still others are resynthesized into the microbial protoplasm."[10]

It is apparent that adequate ammonia for structural purposes is naturally present in a domestic sewage sludge. Industrial wastes of a predominantly carbonaceous character and therefore deficient in nitrogen, may require artificial make-up. Genter claims that high ammonia concentration in digested sludge interferes with sludge conditioning and recommends elutriation for the washing of ammonia from the sludge particles, as a preliminary step to successful and economical sludge conditioning and filtration.

There is no loss of nitrogen during digestion. There is a change of nitrogenous materials from insoluble form to soluble form. In raw solids 98.6 per cent of nitrogen is insoluble. In digested sludge 56.8 per cent of the original nitrogen is in the solids phase and 43.2 per cent in solution.[9]

Receiving Streams

The role of unoxidized nitrogen as ammonia in receiving streams is not as yet very clearly understood. Eliassen[11] cites the undesirability of depositing nitrates in streams, because of their stimulation of algal growths, and recommends their elimination wherever possible.

Whipple[13] states *"Ammonia nitrogen;* of all the inorganic compounds found in the water of streams, those of nitrogen, particularly ammonium salts and nitrates, are of greatest influence upon the production of river plankton . . . All streams contain at least traces of ammonia nitrogen . . . streams defiled with organic wastes from human habitation and industry contain more than either of the others. In the presence of dissolved oxygen, ammonium salts do not tend to accumulate, being oxidized by nitrifying bacteria to more stable compounds. Nitrates . . . It is not uncommon to find in streams that have recovered through natural processes from heavy pollution, several parts per million of nitrogen in the form of nitrates. Here is evidence of immediate fertility, for according to present knowledge, nitrates represent the most easily assimilated form of nitrogen that is available for plant growth."

Sawyer[12] reporting on Big Sioux River studies discloses that zero dissolved oxygen was established in a 35 cfs. stream at winter temperature by introduction of several million gallons of plant effluent containing no oxidized nitrogen.

Apparently fertilization in a greater or lesser degree, immediate or deferred, occurs with the deposition of either oxidized or unoxidized forms of nitrogen and is inevitable.

Of paramount importance, however is the oxygen demand loading imposed upon streams by the deposition of unoxidized nitrogen in ammoniacal or organic form. "Based upon D. O. standards for fish propagation, the B.O.D. due to nitrification may be as important as the so-called carbonaceous demand."[14]

Townend[15] stresses the importance of attaining the nitrification stage of treatment for the preservation of good stream and river conditions.

The Carbon : Nitrogen ratio is of the utmost importance in connection with these considerations. For example, a plant effluent substantially divested of its carbon content, but retaining a large part of its unoxidized nitrogen will display stability due to

the carbon deficiency. However, upon deposition in a receiving stream, having carbonaceous material present of plant or animal origin, oxidation of organic and ammoniacal nitrogen will occur.

Butcher, Longwell and Pentelow [18] showed that increased temperature caused a rapid increase in ammonia which is converted to nitrites and nitrates.

O'Shaughnessy and Roberts[19] advance the view that Adeney's two stage oxidation does not apply under certain conditions. When some of the humus material produced during the nitrification stage is introduced, carbon and nitrogen oxidations proceed simultaneously and the oxidation of ammonia does not depend on the absence of unoxidized carbon, but upon the presence of humus solids. The function of these humus solids for the nitrification is not explained, but it can be readily ascribed to the introduction of nitrifying bacteria. In other words, the failure of the oxidation of ammonia simultaneously with the oxidation of the carbonaceous materials is not due to inhibition of nitrification by carbonaceous material as much as it is to the slower rate of development of nitrifying bacteria.

Chu[20] reports, based on stream studies, that with few exceptions the algae investigated grew equally well in media supplied with nitrate and in those supplied with ammonia salts.

Todt[21] recommended determination of phosphate, nitrate and ammonia for estimating the degree of pollution of a stream by domestic sewage. Waksman[3] stated, "As to the nitrification of organic nitrogenous substance this has to be preceded first by their transformation into ammonia. In other words, only the substances can be nitrified, which can first be converted into ammonia, an alkaline reaction being necessary."

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Book on Care and Repair of the House

A book of interest to water and sewage works men is the revised edition of "Care and Repair of the House," published by the U. S. Bureau of Standards.

This book, containing more than 200 pages, presents timely information on the repair and maintenance of homes based on the results of about 50 years research and testing by the Bureau.

One of the features of the publication is its check list that may be followed in order that defects may be found in time before major repairs are necessary.

Copies of the book are available at 50 cents each from the Supt. of Documents, United States Government Printing Office, Washington, D.C. (No stamps, please, says the Printing Office.)

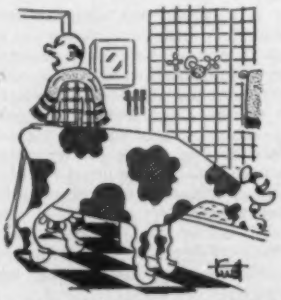
New England Industrial Wastes Conference

A three-day New England Industrial Wastes Conference is scheduled for June 26-27-28 as a feature of the 1950 summer session of the Mass. Inst. of Technology.

The M.I.T. Dept. of Civ. and San. Engrng. will be joined in sponsoring the event by the New England Council and the N.E. Sew. Wks. Assn. Profs. Rolf Eliassen and Clair N. Sawyer will represent M.I.T. in charge of the conference.

The Industrial Wastes Conference is designed to bring together three groups for discussion of water pollution control engineering: (1) Industrialists, (2) Representatives of stream pollution and water control agencies, and (3) Research workers and consulting engineers in the field of industrial wastes problems.

There will be symposia on water and waste problems of specific New England industries including pulp and paper, wool scouring, cotton and wool dyeing, metallurgy, potato and milk processing, and leather tanning. A special symposium on future needs and developments will conclude the three-day meeting.



Yes, I know we still have a water shortage —and that the Commissioner says that soapy water makes richer milk—but, for the love of Mike keep "Bossy" down stairs 'til I can get outa' th' bloomin' tub, won't you?

So. Jersey Water Supts.' Shad Dinner

The 23rd annual "Planked Shad Dinner" of the South Jersey Association of Water Superintendents was held this year on May 5, at the Salem Country Club in Salem, N. J. In true tradition of the annual affair, large freshly-caught Delaware River Shad are planked on "Ye Olde Oaken Planks" in front of a huge open fireplace. A large crowd attended the meeting. Secretary of the association is Walter Spencer, Supt. of the Merchantville-Pennsauken Water Commission.

Mich. Sew. Wks. Assn. Meeting

On May 22-24, the Michigan Sewage Works Assn. met in Traverse City, Mich., for the second time in two years. The program included papers on sewers, U. S. Pub Health Service, pollution of underground waters, role of streams and lakes in stabilization of sewage, industrial wastes pollution indices, biological treatment, and chemical treatment of industrial wastes. Attendance was good and enthusiastic.

"On Doing a Little More"

Most people do what they are asked to do; successful people do a little more.

35TH MEETING N. J. SEWAGE WORKS ASSN.

Changes Name to N. J. Sew. & Ind. Wastes Assn.

Presidents

Incoming	Outgoing
John Struss	*Leslie J. West*
Supt.	*Supt.*
Sew. Tr. Wks.	*Sew. Tr. Wks.*
Wildwood, N.J.	*Elizabeth, N.J.*

MEETING again in Trenton, N.J., on March 22-24, the New Jersey Sewage Works Assn. held its 35th annual convention. In addition to four technical sessions, and the famous "speechless" dinner, the meeting featured an exhibition of manufacturers' equipment.

New Officers

At the business meeting, the following members were elected to serve for the ensuing year:

President
John Struss, Supt.
Sewage Treatment Works
Wildwood, N.J.

First Vice President
Sol Seid, Supt.
Sewage Treatment Works
New Brunswick, N.J.

Second Vice President
Paul Molitor, Supt.
Madison-Chatham Sew. Wks.
Rutherford, N.J.

Secretary-Treasurer
M. S. Kachorsky, Supt.
Water & Sewage Works
Manville, N.J.

Business Session

In addition to electing officers for the ensuing year, the organization voted two important constitutional changes. The first of these changes was a change in name. The new name of the Association is New Jersey Sewage and Industrial Wastes Assns. The other constitutional change will make it possible for the annual meeting to be held in other communities in New Jersey as well as in Trenton, where it has heretofore been held regularly.

Ralph E. Fuhrman, Vice-President of the Federation of Sewage Works Assns. presented a brief report covering the highlights of Federation activities and discussed plans for the 1950 meeting to be held in Washington. He extended a cordial invitation from the Federation and the members of the Md.-Del. Assn. to the 1950 meeting.

(The following session was reported by Harry A. Faber, Editorial Associate, *Water & Sewage Works.*)

Vice Presidents

First	Second
Sol Seid	*Paul Molitor*
Supt.	*Supt.*
Sew. Tr. Wks.	*Madison-Chatham*
New Brunswick, N.J.	*Sew. Wks.*
	Rutherford, N.J.

Awards Presented

Three members of the New Jersey Sewage Works Association were honored during the meeting by presentation of 1949 FSWA awards.

The *CHARLES A. EMERSON AWARD* was presented to William J. Orchard, Gen. Mgr., Wallace and Tiernan Co., Inc., Belleville, N. J. In the accompanying citation, Mr. Emerson wrote: "Mr. Orchard's entire career has been characterized by activities for the public good." The award was accepted for Mr. Orchard by R. B. Mowry of W & T, who expressed "Bill" Orcard's regret that illness prevented him from being present to express his appreciation for the signal honor conveyed by the award.

The *ARTHUR BEDELL AWARD* was presented to Harry P. Croft, Chief Engineer, Sanitary Section on Public Health Engineering, State Department of Health, Trenton, N. J. Mr. Croft, a charter member and organizer of the New Jersey Sewage Works Association, was cited for contributing most to the advancement of his local association. The award was accepted for Mr. Croft by Mr. L. W. Klockner, Superintendent of the Trenton Water Department.

The *HARRISON PRESCOTT EDDY AWARD* was presented to John W. Hood, Supt. of Sewage Treatment Plant, Ridgewood, N. J. The accompanying citation called attention to Mr. Hood's meritorious services and his research which has brought distinction to the New Jersey Association. Four of the five Eddy Awards made to date have been awarded to members of the N.J. Sewage Works Assn.

Three "Past Presidents' Keys" were presented at the meeting. In addition to the key presented to Leslie E. West, Retiring President, keys were also presented to Past Presidents L. J. Fontenelli (1946-1948) and John W. Zimmerman (1944-1946). Mr. John R. Downes, who made the presentations, said the belated presentation of keys was caused by a wartime shortage of metal.

ENVIRONMENTAL SANITATION

N.J. Sanitation Program

"SEWAGE DISPOSAL IN AN ENVIRONMENTAL SANITATION PROGRAM" by Alfred H. Fletcher, Dir. Bur. of Envir. Sanit., New Jersey State Department of Health.

Mr. Fletcher's discussion was of wide interest because the new state constitution has provided for an ex-

Secy.-Treas.	Fed. Director
M. S. Kachorsky	*L. J. Fontanelli*
Supt.	*Supt.*
Wat. & Sew. Wks.	*Sew. Tr. Wks.*
Manville, N.J.	*Rahway, N.J.*

Programmers

W. Rudolfs
Chair.
Dept. Sanit.
Rutgers, Univ.

David L. Muss
San. Engr.
Heyden Chem. Corp.
Princeton, N. J.

panded sanitation program. To accomplish such expansion, it was pointed out, requires specialists in environmental sanitation. Mr. Fletcher stated that strengthening these activities at the local level was considered essential, but that local health officers were not equipped to handle special problems.

Among local problems which now exist are those caused by inadequate septic tanks, sewers, and sewage treatment; by lack of lincensed sewage plant operators; by needed improvements in public water supplies; and by a more suitable plumbing code.

More than half of the State, Mr. Fletcher noted, is comprised of potable watershed areas. Pollution of streams has been intensified by the increased number of industrial plants which have come to New Jersey since the last war.

At present, there is a serious shortage of technical personnel in the Bureau of Envirinmental Sanitation. Mr. Fletcher indicated that major efforts would be devoted to advancing the proper operation of sewage treatment plants *at the local level*, and to improving the relation between plant officials and local health agencies.

JOHN R. DOWNES (Supvr. Engr., Plainfield) asked if, in the expanded sanitation program, the control of sewage treatment plants is to come under local boards of health. Mr. Fletcher implied this would be generally true, saying that the State Health Department will be unable to make the previous number of plant inspections and will recommend a closer tie between the local health officers and the sewage treatment plant.

L. H. ENSLOW, Editor, *Water & Sewage Works* asked concerning plans for licensing plant operators under this new regime. Mr. Fletcher replied that licensing is one of the features to be emphasized in strengthening local health programs.

Public Officials Viewpoint

"THE VIEWPOINT OF PUBLIC OFFICIALS ON THE ENVIRONMENTAL SANITATION PROGRAM" by Hon. G. Harry Cullis, Permanent Chairman, Joint Meeting Maintenance for certain Municipalities in Essex and Union Counties.

Discussing the marked increase in industrial operations, Mr. Cullis stated that many examples exist where the present treatment facilities are inadequate. Unsatisfactory cooperation between municipalities and industry is not always willful, but may be caused by financial conditions; local need for streets, schools, etc., may take precedence. Pollution control projects must be sold to the public as a critically needed undertaking.

The sewerage system and the sewage treatment plant at Elizabeth, N. J., was described: treatment is presently provided for about 400,000, but the plant has a future capacity for about one million population or its equivalent load. The Joint Meeting organization includes one representative from each of the twelve communities which are included. Total cost of operation and maintenance of 51.6 cents per capita per year ($12 per mil. gal. for a present flow of 37.9 mgd.) is considered relatively low as compared with the operation of sewers and sewage treatment plants by each individual community.

Role of Sanitary Engineer

"THE ROLE OF A SANITARY ENGINEER IN THE ENVIRONMENTAL SANITATION PROGRAM" by Thomas F. Bowe, Cons. Engr., Bowe, Albertson and Associates, New York, N. Y.

Mr. Bowe discussed the new designation, "environmental sanitation," as including activities designed to prevent illness from reaching man. The consulting sanitary engineer has an important function in cooperating with health authorities to develop water purification, sewage and industrial waste treatment, garbage and refuse disposal, and air pollution control in the environmental sanitation program.

While large public and municipal utilities have competent technical staffs, the smaller communities are not so fortunate. Accordingly, the sanitary engineer should place more importance on personal contact with local health authorities in order to support constructive criticism and to secure additional precautionary measures.

Sanitary engineers have been responsible for the development, in Northern New Jersey, of a master

Programmers

John R. Hoid
Supt.
Sew. Treat.
Ridgewood, N.J.

L. L. Langford
East. Mgr.
PFT
New York City

plan for collecting and treating the sewage of some 500,000 people; this plan will eliminate 26 existing treatment plants and will remove the possibility of constructing 19 potential plants. Other such master plans are being considered in New Jersey and elsewhere, because of the economical features of joint operation and maintenance.

The sanitary engineer has received much assistance in the solving of industrial waste problems from government and industry itself. The work of the sanitary engineer in all its aspects has been closely allied with public health departments of Federal, state and municipal governments. Each has shown a marked interest in the constructive progress of engineers. Vast fields still remain to be conquered in the advancement of public health through environmental sanitation programs.

INDUSTRIAL WASTE TREATMENT

With DR. WILLEM RUDOLFS, Chairman, Dept. of Sanit., Rutgers Univ., New Brunswick, N.J. acting as Moderator, one session was devoted to the presentation of papers on industrial waste treatment.

Fibre Recovery

"REDUCTION IN LOAD ON SEWAGE TREATMENT PLANTS BY FIBRE RECOVERY" by Nelson L. Nemerow, Research Assistant, Dept. of Sanit., Rutgers University.

Mr. Nemerow discussed various types of paper mills and the type of fibrous waste discharged from each. Fibers which reach streams cover the bottoms, and deplete oxygen. In sewage plants fibres cause sludge blankets and in digestion tanks cause various difficulties of operation.

Among the plants cited as suffering from fibrous wastes were the Munroe, Mich. and the Rahway, N.J. plants, Savealls in paper mills reduce the amount of fibrous wastes and coagulation and vacuum filtration further improve the waste. These wastes can be

Program
A. F. Fletcher
Director
Bur. Envir. San.
Trenton, N. J.

Exhibits
Dorothy Dimmers
Act. Secy.
WSWMA
New York

treated in municipal sewage works but sufficient capacity is absolutely essential to prevent operation difficulties.

Penicillin Wastes

"THE TREATMENT OF PENICILLIN WASTE" by David L. Muss, San. Engr., Heyden Chemical Corp.

Mr. Muss reviewed the history of antobiotics and described the manufacturing process by which penicillin is produced. Also described were the wastes from the process. In large cities, the waste from penicillin has little effect on sewage or sewage treatment, but small treatment plants and small streams are greatly affected.

During the presentation a number of slides were shown to illustrate the construction and operation of a pilot plant. This plant which cost $65,000 was operated for 13 months on various combinations of treatment. From these experimental studies, it was determined what combinations produced the greatest color removal, the most effective B.O.D. reduction and the cost of operation necessary to obtain the desired 99 per cent reduction of waste load.

Chewing Gum Wastes

"BREAKING IN OF AN INDUSTRIAL WASTE TREATMENT PLANT" by Harold Orford, Research Asst., Supt. of Sanit., Rutgers Univ.

This paper dealt with the operation of a plant treating chewing gum wastes. Mr. Orford outlined the essential things that must be done to start up a treatment plant. These included: Setting operating routine, choosing sampling locations and schedules, picking good operators, obtaining good analyses, keeping good records, and other items.

One of the problems at this particular plant was a high sulfate water which produced 150 ppm. of H_2S. Part of this was burned but the remainder had to be treated with 1000 ppm. of chlorine to keep down odors. The treatment plant included a settling tank, and digester for the soluble organic waste, and a sand filter to treat the effluent from the digester.

To overcome some of the problems, a new water supply of low sulfate content will be used, and additional sand beds will be constructed. Holding a seed in the digester presents difficulties since the material carries no solids.

Sewage Treatment With the "Aero-Accelator"

In a session especially devoted to papers presented by manufacturers' representatives the opening paper was presented in abstract by Fred A. Eidsness, Eastern Representative for Infilco, Inc., who described the "Aero-Accelator" as a modification of the water treatment "Accelator" in which the "slurry" is biologically produced sludge, mechnically mixed with the incoming screened (not settled) raw sewage. At the point of mixing and agitation at the bottom of the "slurry" pool a moderate quantity of air is introduced. From that point on the aerated "activated slurry" travels the same path as does the inorganic sludge slurry in the water treatment "Accelator." In short the "Aero-Accelator" functions as a combination settling, activation, oxidation and clarification unit in a single unit. The effectiveness of this combination unit is apparently due to the very high ratio of biological sludge to incoming sewage, resulting in high degree of absorption by the sludge kept aerobic by the economical input of air.

Mr. Eidsness briefly described the Daytona Beach, Fla., plant which makes use of sewage "Accelator" units for rapid clarification of sewage treated with slurry from the municipal water softening plant. He also cited pilot plant results with the "Aero-Accelator" on Elmhurst, Ill., sewage (see article by A. A. Kalinske in W.&S.W. for April, 1950, which reports on the Elmhurst studies) and the stronger sewages of Austin, Texas, and Sioux Falls, S Dakota, wherein retention periods through the "Aero-Accelator" amounted to between 2 and 4 hours and the total air input between ½ and ¾ cu. ft. per gallon for sewages of not more than 250 B.O.D., productive of a final effluent of 25 B.O.D.

Mr. Eidsness stressed the value of having a single combination unit capable of serving as primary-settling, aeration, mixing, final clarification and sludge concentration units all in one. While much more was to be learned about the ultimate performance as well as the limitations of the short period "Aero-Accelator" treatment, it had so much in its favor already demonstrated that it deserved careful attention of engineers seeking economical sewage and waste treatment facilities for the smaller municipalities in particular.

Developments in Sewage Aeration Equipment

NEW DEVELOPMENT IN AERATION EQUIPMENT were reviewed by J. D. Walker and John R. Sperry, Walker Process Equipment, Inc., Aurora, Ill

Mr. Sperry presented the review in which he described in some detail the advantages of the Impingement Type Aerators which do not suffer cloggage troubles and result in lower operating and maintenance costs. The resulting air bubbles from the jet type impingement diffusers are smaller than those from porous plaster of 30 permeability ratings. Each jet delivers 50 to 60 c.f. of air per minute producing thorough mixing, recirculation and effective aeration.

Aside from use of Jet Diffusers in activated sludge, Mr. Sperry emphasized the increasing application of pre-aeration of crude sewage with non-clogging Jet Diffusers operating under 2 to 5 lbs. pressure. He also listed additional applications as in re-carbonation of softened water, grit washing in channel type grit chambers, industrial waste treatment and even the injection of chlorine

F. A. Eidsness
East. Rep.
Infilco, Inc.
Philadelphia

S. E. Kappe
Mfrs. Agent
Chicago Pump Co.
Washington

John R. Sperry
East. Mgr.
Walker Pro. Eq.
New York City

A. R. Reinert
East. Rep.
Cloroben Corp.
Jersey City, N. J.

Programmers

gas with jets made of non-corroding materials.

Air Diffusion in Sewage Treatment

AIR DIFFUSION IN SEWAGE TREATMENT was the topic assigned Stanley E. Kappe, representing Chicago Pump Co. of Chicago.

Mr. Kappe, without discussing the particular method of air diffusion, reviewed the modern applications of diffused air, in which the most important has been pre-aeration in conjunction with primary settling. Mr. Kappe stated that there was ample reason for the rapid adaptation of pre-aeration involving 0.1 cu. ft. of air per gal. and a period of 30 to 45 minutes to freshen the sewage, produce some flocculation and pronouncedly improve performance of primary sedimentation units. He cited cases in which pre-aeration of stale sewage resulted in 30% B.O.D. removal through the primary tanks being boosted to 66% removal. In grit chambers 1 to 5 minutes of air diffusion had resulted in far cleaner grit, odor elimination and better primary settling tank performance. He mentioned the growing application of short period bio-flocculation (high rate activated sludge) with less than 2 hours of aeration such as developed for New York City and adopted for the new Los Angeles plant.

The effectiveness of pre-aeration in raising the efficiency of trickling filters was also stressed by Mr. Kappe. Furthermore, the applicability of aerobic flocculation and oxidation in treatment of organic industrial wastes, such as penicillin wastes, had recently been demonstrated.

Improving Digester Behavior

IMPROVEMENTS AT THE DIGESTER WITH CLOROBEN were cited by A. R. Reimers of the Chloroben Corp. who reported on experimental results at 3 plants where "Cloroben" had been applied to the top sludge (scum) in digesters whereupon the scum matter liquefied and sank in due time. Thereafter the "Cloroben" application was made daily to the sludge pumped into the digesters. At Essex Falls, N.J., application of 100 ppm. "Cloroben" to the scum layer had resulted in scum thickness reduction from 5 ft. to 2 ft. in 80 days. At Middlesex, N.J., an application of 200 ppm. (figured on scum volume) had reduced the scum depth from 4.5 ft. to 2 ft. after 50 days. At the same time the density of the sludge drawn from the digester of another plant (unnamed) had increased from 4.6% solids to 6.2% solids as the result of adding 50 ppm. of "Cloroben" to the sludge input to the digester. This effect of scum thinning and reduction of volume had first been tried on septic tanks with good effect and no bad effects.

To many, the ability of a single material to effect thinning of "top sludge" (scum) and simultaneous thickening of bottom sludge was viewed as something of a mystery, but Mr. Reimers confirmed this observation in the question period.

The Role of Alkalinity in Activated Sludge Treatment

THE MECHANISM OF OXIDATIVE SEWAGE PURIFICATION—ITS MEASUREMENT AND INTERPRETATION was the subject of a profound paper by W. W. Eckenfelder, Jr., and John W. Hood, chemist and Sup't. respectively of the Ridgewood, N.J., Treatment Plant and Experimental Station.

Since this paper has already been printed in abridged form in our May, 1950, issue we will not attempt to cover the findings of the author's in any detail.

Briefly stated the Ridgewood studies reveal that the "Oxidative Performance" in sewage treatment by any bio-oxidation process can be evaluated through the simple procedure of determining the total titratable alkalinity of the sewage as it progresses through the oxidation treatment to the final effluent. The alkalinity determination is the simple titration with methyl-orange indicator as given in Standard Methods of Water & Sewage Analysis. The total alkalinity decreases in almost direct proportion to the degree of purification which involves oxidation of ammonia and other compounds. It was interesting to observe this turbidity curve, for the sewage as it progresses through the oxidation process breaks at the same point at which the total alkalinity curve breaks. This is to say that the alkalinity curve is a more effective index of the degree of conversion of the organics in sewage to mineralized compounds than is the B.O.D. test taken alone. The alkalinity test is much quicker and can be more accurately made and is therefore likely to prove the more practical and dependable control and evaluation test of the two.

Messrs. Hood and Eckenfelder define "Oxidizable Alkalinity" as the total alkalinity of the sewage at any point during its course through the plant less the natural alkalinity of the water supply of the community.

We would urge readers to carefully study the Hood-Eckenfelder paper in our May, 1950, issue, without any preconceived ideas, and with the realization that there is still room for discovery in sewage treatment and simplification of laboratory methods of evaluation thereof.

L. L. LANGFORD, Pacific Flush Tank Co., in a prepared discussion was high in his praise of the nature of investigative work being undertaken by Messrs. Hood and Eckenfelder at Ridgewood and extended to other plants. The "Nitrogen Oxidation Index" and "Oxidizable Alkalinity" seemed to be closely related and the "OA" for plant effluent if divided by the value found in the influent will approximate the per cent of organic and ammoniacal nitrogen oxidation.

JOHN HOOD (Ridgewood, N.J.) had found no advantage from the addition of ammonia salts to digesters. Heating coils in digesters had encrusted badly due to the hardness of the water—not on the interior but the exterior.

PAUL MOLITOR (Rutherford, N.J.) reported on the external heat exchanger which had given excellent results at Rutherford.

Operator's Breakfast

In the Operator's Symposium following the Operator's Breakfast presided over by Louis J. Fontenelli, Sup't. at Rahway, N.J., the following was developed:

JOHN HOOD (Ridgewood, N.J.) stated that automatic sludge pumping had improved solids removal in primary sedimentation.

H. VAN DER VLIET (Maywood, N.J.) and SOL SEID (New Brunswick, N.J.) were in agreement that we could have periods of detention in primary tanks which were deleterious to the quality of effluent and productive of odor nuisance unless the sewage reached the plant in a fresher state than is usually the case.

L. FONTENELLI (Rahway, N.J.) had observed digestion to the optimum at 93-95° C. which is almost that of boiling water. However, the quality of supernatant was better at lower temperature.

DR. FISCHER (Dorr Co.) said that no difficulties with digester behavior was experienced in going from normal temperatures to the thermophilic range, but trouble could be expected when reversing this procedure.

SEWAGE TREATMENT PLANT EQUIPMENT

Grit Chambers

The Second Article of a Series

by
FRANK L. FLOOD
PARTNER
METCALF & EDDY

THE more prominent of the various means that have been used for the mechanical removal of grit from grit chambers at sewage treatment plants may be summarized as follows:

Scraper blades or flight conveyors
Bucket conveyors
Inclined flight conveyors
Inclined screw conveyors
Vertical bucket elevators
Belt conveyors
Grab buckets
Grit eductors and ejectors

The above equipment may be used separately or in various combinations. The grit may be collected at the influent end of channels by means of flight conveyors, scraper blades, or horizontal bucket conveyors, and then elevated by inclined flight conveyors, inclined screw conveyors, or by vertical bucket elevators or be pumped by eductors or ejectors. The grit as elevated from the individual channels may be then transported by means of flights, buckets and screw or belt conveyors to further treatment units or to points of disposal.

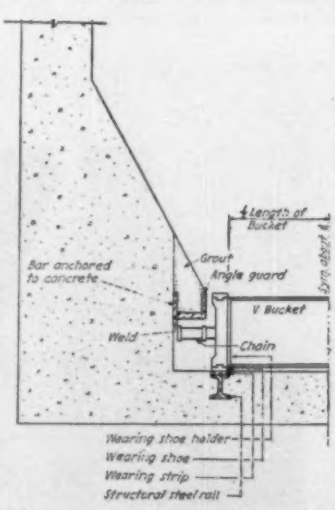
It is difficult to obtain manufacturers' agreement on recommendations for grit channel equipment. Each manufacturer has his own ideas as to what should be provided. These ideas are influenced, in part at least, by one of several reasons. Generally, the manufacturer desires to incorporate methods and equipment which: (1) he has tried and perfected to a reasonable working basis, (2) has become more or less standardized with the company, (3) he holds patents on, (4) will avoid infringement of patents held by others, or (5) will enable the manufacturer to compete on a favorable basis for the work of furnishing the equipment.

Severe Wear Encountered

The scraper blades and flights used for conveyors and elevators, the bucket conveyors and elevators or the inclined screen conveyors and elevators, all require moving equipment immersed or partially immersed in the sewage and grit. Due to the abrasive character of the materials handled and other operating conditions, grit chamber equipment of this type is subjected to a high rate of wear. In its design, therefore, the emphasis should be placed upon rugged, durable construction, with ready means for replacement of worn parts.

The Author

The operation of equipment in the grit chambers at Buffalo has been described by Johnson[1]. In these chambers the grit is collected by flights riding on rails embedded in the concrete floor. The shoes on the flights wore out rapidly and when replaced by shoes of highly resistant metal the soft steel guide rails wore down and had to be renewed. A design was developed in which the wear was taken by an easily replaceable wearing rail.



Typical Section of Corner of Grit Channel

Tail bearing assemblies at the ends of the inclined screen conveyors were cut to pieces within a short time by the passage of fine grit particles into the bearing. The life of this bearing was prolonged by a combination of steel, rubber and paper gaskets with an adjustable packing gland which has excluded for a longer term and to a greater extent the working of abrasive material back into the bearing.

The grit chamber equipment at the District of Columbia Blue Plains plant was originally supplied with inclined screw conveyors with thrust bearings near the bottom of the grit hoppers. Because of continual submergence in grit, these bearings lasted only a very short time. To overcome this difficulty, the bearings were replaced by ball thrust bearings above the sewage level. In addition to eliminating the frequent failure of the underwater bearings, much smoother operation of these units resulted.

The grit chamber equipment at the Toronto Ashbridges Bay plant includes bucket conveyors and elevators on parallel endless strands of chain. The rails in the concrete channel bottom have readily replaceable wearing plates. The attachments supporting the buckets include removable wearing shoes of gray cast iron to ride on the rails imbedded in the channel bottom and on the angles supporting the return flight. The return angle rails and the removable wearing shoes are of ½ in. thickness.

In an effort to reduce the wear on chains, attachments, shoes and rails, the Chain Belt Co. has devised and advocated construction as shown in the accompanying figure. This provides in effect a chain guard which prevents grit from falling directly onto or compacting directly upon the conveyor chain, thus reducing the

Sheboygan, Wis.—Two Rex Grit Collectors and Rex Separate Grit Washer
(Sluice trough—center of picture—receives grit from both bucket type collectors and discharges it into inclined grit washer.)

abrasive action of the grit on the chain, its supporting attachments, and the guide rail.

Overload and Shear Pins

In the past, grit-collector equipment has been protected from overload largely by the use of shear pins. The objection to the use of shear pins has been that as these break under overload the operators have been inclined to replace them with stronger pins until a chain, sprocket, shaft or other element is seriously damaged or broken requiring major repairs. The development and use of stalling torque motors on grit chamber equipment so as to eliminate the use of shear pins was discouraged during the war and has been somewhat neglected since. Recently adjustable overload release devices have been advanced which are designed to mechanically disengage the grit collectors from the motor when overloads are encountered.

In order to secure truly competitive bids on grit chamber equipment, it may be necessary to provide detailed specifications and reasonably detailed plans.

The hunting tooth or extended life sprocket of alloy cast iron with a nickel content of 1.00 to 1.25 percent and a chromium content of 0.45 to 0.65 percent with teeth chilled to give a hardened wearing surface should give reasonable life.

Velocity Control

In many grit channels the effective removal of grit is dependent upon control of velocity. Various devices have been used to effect control so that a velocity in the vicinity of 1 ft. per second is maintained throughout the range of sewage flow from minimum to maximum for which the channel is designed. This may be accomplished by properly designed proportional weirs for rectangular channels which increase the depth of flow in direct ratio to the increase in rate of flow. This plan may require considerable loss of head at the grit channel during maximum rates of flow.

It is common practice at present to provide control sections following grit channels, such as the Parshall flume or the Camp regulator as manufactured by American Well Works[2], and to design the cross-section of the grit channel to suit the backwater conditions created by the control section. Where the Parshall flume serves as the flow level control section for the grit channels, it is also usually adapted for measurement of sewage flow[3]. It is convenient to provide a flow indicator at the flume and adjacent to the grit channels so that the experienced operator can readily determine the number of channels which it is advisable to have in operation.

Grit Conveyors

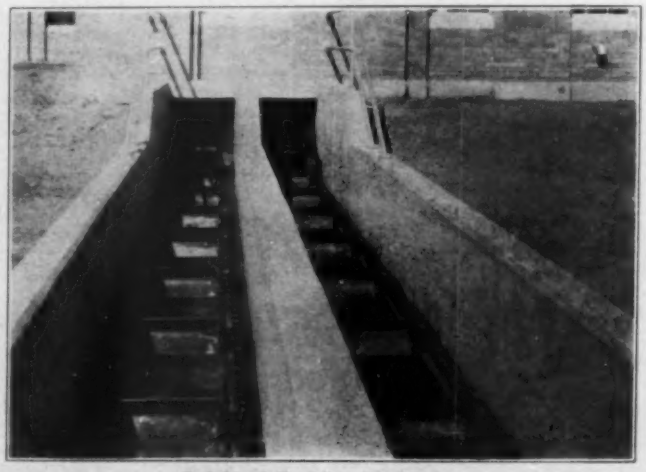
Belt conveyors for horizontal transportation of grit from multiple grit channels to grit-washing, storage, and disposal points, appear to operate with less maintenance costs than scraper, bucket, or spiral conveyors.

Pneumatic grit ejectors as made by Krajewoski - Pesant Manufacturing Co. are provided at the Tallmans Island plant in New York for discharging grit from the grit house to storage tanks in an adjacent building.

Fuller[4] reports successful operation with a pneumatic grit washer and ejector at Olean, New York. He states that formerly six man-days were required to remove the grit by hand, chain hoist, and truck, followed by burial, whereas the air-lift system washes the grit and disposes of it in thirty minutes. The washed grit is discharged to the Allegheny River. It is noteworthy that the air-lifted grit discharges through a 6-in. pipeline as compared with 3-in. and smaller pipelines used in connection with some grit eductors and jet pumps.

Grit Cleaning

The purpose of providing grit cleaning equipment is to remove the organic and putrescible materials settling with the grit so that the resultant product will be relatively free from objectionable characteristics, particularly odor.



Rock Island, Ill.—Jeffrey Grit Collectors

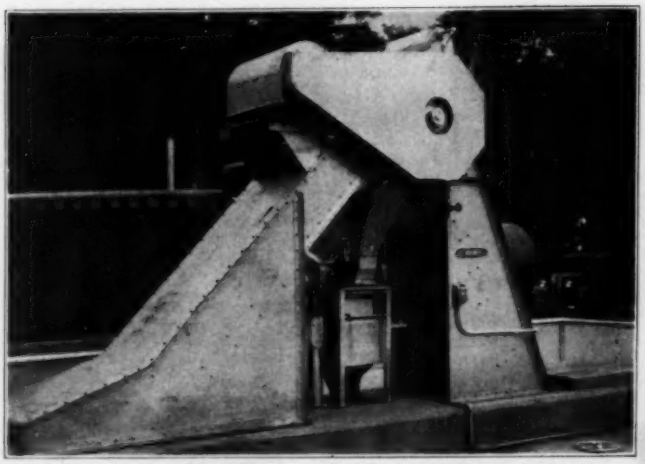
A relatively clean grit can be obtained if the grit disposal conditions make this necessary. Under ordinary conditions of grit disposal in spoil areas, grit of satisfactory quality may be obtained by one of several different processes. In many plants, satisfactory results have been obtained by returning the grit as first removed, back to the inlet of the grit channels at the surface of the flow. The grit is thus washed in the sewage flow and after washing is again removed by the equipment provided therefor.

The Dorr detritor has been described and operating data from 41 installations has been reported by Kivell and Lund[5]. The detritor grit chamber is square in plan. The grit is collected at one side of the chamber by means of scraper blades on revolving arms, and is then elevated by means of reciprocating scraper blades working on an inclined plane. The reciprocating rakes create turbulence and a back and fill motion as the grit is carried up the slope, which tend to throw light organic materials into suspension.

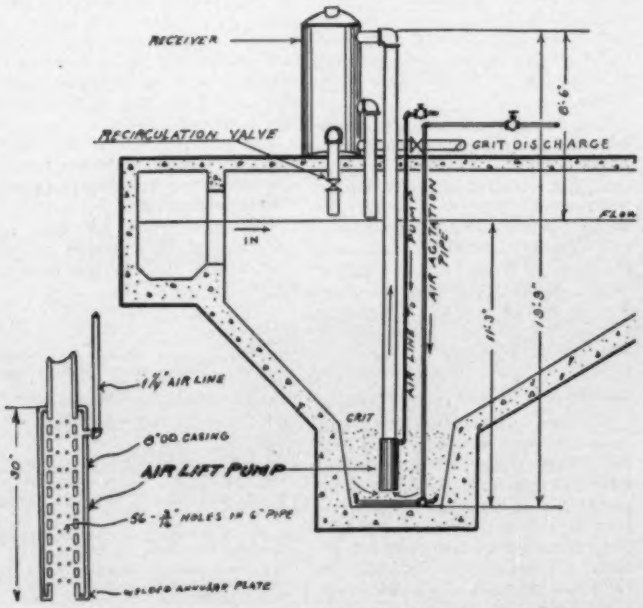
Other manufacturers recommend the use of an inclined screw conveyor for removing the grit directly from the grit channels. The Link Belt equipment at Peoria and the Chain Belt equipment at the District of Columbia are of this type.

In some plants the grit as removed from the grit channels is deposited in separate grit-washing channels equipped with either inclined screw conveyors or reciprocating rakes.

The "Jigrit" washer as manufactured by Jeffrey has been installed at several New York City plants and has been selected for the Nut Island plant in Boston and the Ashbridges Bay plant in Toronto. The grit as removed from the grit channels is discharged to the "Jigrit" for separation by stratification and washing of adhering organic solids. The principal wearing part in the washer is the diaphragm which in some instances has required replacement on the average of once each year. The early tests of this equipment at the Indianapolis plant have been reported by Nichols and Tolman[6].



Wisconsin Rapids, Wis.—Jeffrey Jigrit and Collector



Olean, N.Y.—Details of Pneumatic Grit Washer and Ejector—After Fuller

Grit Storage

In mechanically-cleaned grit chambers of conventional design in which the grit is moved by means of flights, buckets or screw conveyors, the equipment must be operated as frequently as is required to prevent it from becoming buried in grit to the extent that it will not start up. Intermittent operation may be practical during dry weather, but frequently continuous operation is necessary during periods of storm flow. In many plants it is necessary to provide some form of grit storage facilities to act as a reservoir between the operations of grit removal and the filling of trucks to haul it away for disposal. Elevated storage bins have been quite commonly used. It has frequently been found that the grit compacts in the conical hopper bottoms of these bins above the grit draw-off gate, making it difficult to load the trucks. It has been found that air introduced to the grit bin just above the gate makes it possible for the grit to flow so that it can be drawn off readily and smoothly.

Particular attention should be given to the design and construction of gates beneath the storage bins. In several plants the gates installed have been difficult to operate manually and various expedients have been used, including extension of lever arms and, at one plant, by the addition of a block and tackle.

Provision should also be made for collecting and disposal of drainage from grit storage hoppers. A device

consisting of a pan beneath the grit draw-off gate supported by a swiveled pipe arm which can be swung out of the way during truck-loading periods, has worked successfully.

Aerated Grit Channels

The accumulation of grit in aeration tanks, not preceded by sedimentation tanks or adequate grit chambers, has been observed for some time, particularly when the tanks have been equipped with elevated diffusers. Air has also been used in grit separation tanks in an attempt to separate out light organic materials. However, so far as we are informed, it is only recently that an attempt has been made to develop a rational basis of design for spiral flow aerated grit-separation tanks.

The apparent advantages of the aerated grit chamber as compared with other types are: (1) complicated control of velocity is not required, (2) variations of rate of flow through the chambers are of little importance, (3) the grit as removed does not require further washing for removal of organic materials, and (4) the grit can be allowed to accumulate in the grit hoppers and removed for disposal as may be convenient.

The most practical method of removal of grit from aerated grit channels will depend in part upon the size of the units. The Chicago Pump Co. has been interested in the development of the aerated grit chamber and its possible use in conjunction with preaeration tanks, possibly because of the use of swing diffusers in such tanks. This company has advocated the use of multiple hoppers under the diffuser system in which to collect the grit and its removal by means of jet pumps. The water used for pumping the sand would normally be plant effluent, pumped by a separate high-head pump. The grit-water mixture may be pumped to decanting tanks or grit drainage sand beds.

There is a lack of experience with this type of grit ejector so that it is not known whether it will work with satisfaction under any and all conditions. The foreseeable difficulty with the relatively small ejector nozzle and pipe is clogging with rags or other coarse materials removed with the grit.

The large scale aerated grit chamber installed at the Columbus, Ohio, sewage treatment plant has been described by Grant[7]. At this plant the grit is picked up from tank-bottom hoppers by a one-half-yard clam bucket suspended from a bridge crane with a 60-ft. span over the tanks. The bucket empties into dump trucks.

Bristol, Conn.—Builders—Providence Parshall Flume Register and Recorder

The aerated grit chambers at Columbus replace chambers of more conventional design. Except for the clam bucket there are no moving parts in the sewage so that wear and tear of equipment is reduced to a minimum.

It appears that aerated grit chambers may be used quite extensively in future designs. Their use in conjunction with preaeration tanks will be watched with interest. It appears desirable, for any sizeable units, to provide fine mechanically-cleaned racks ahead of the aerated grit channels so as to reduce to a minimum the quantity of materials which could wrap around and collect on the diffuser tubes and air piping.

Incineration of Grit

The grit at the Buffalo sewage treatment plant was incinerated with the sewage sludge from September 1940 through April, 1941. It is reported that it was found possible to burn as high as 50 percent grit with 50 percent sludge for extended periods and occasionally for short periods to burn grit alone. However, since April 1941 the grit which has about 40 percent volatile material has not been burned and has been transported to a disposal site without reported objection. According to Johnson[1] incinerating the grit caused excessive wear to equipment and caused plugs and clinkering in the ash removal system.

The grit removed at the Detroit sewage treatment plant has been incinerated in multiple hearth furnaces with the sludge cake.

The incineration of grit with screenings at Milwaukee in a multizone rabble furnace has been described by Lewers[9].

References

[1] John W. Johnson, Works Supt., Buffalo Authority, Sewage Works Engrg., August, 1949, p. 386.

[5] American Well Works, Bulletin No. 249.

[6] Grit Chamber Velocities Controlled by Parshall Flume by Stanley T. Barker, WW&S, April, 1939.

[4] Nelson M. Fuller, "Pneumatic Grit Washer" N.Y., WW&S, Oct. 1942, p. 449.

[8] W. A. Kivell and N. B. Lund, WW&S, April, 1940.

[6] R. D. Nichols and S. L. Tolman, Municipal Sanitation Dec. 1938.

[7] Nye Grant, Associate Member Paul A. Uhlmann and Associates, Columbus, Ohio. Eng. News-Rec. July 1949, p. 56.

[9] George R. Lewers, WW&S June, 1939

Head End of the 10 Car Train and Two Typical Interior Views of Exhibits

On left, H. V. Erben, Vice-Pres. and Genl. Mgr., G.E.'s Apparatus Dept., and J. S. Smith, Manager of Advertising and Sales Promotion (nearest camera) Demonstrating Miniature of 230-kv Impulse Breaker.

G.E.'s MORE POWER TO AMERICA SPECIAL

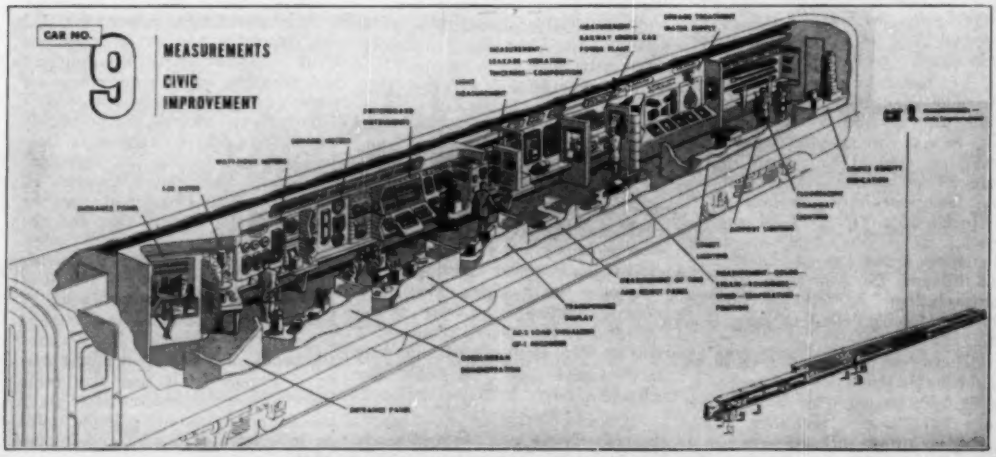
A Bold Undertaking in Industrial Marketing

ON April 24th, at a delectable luncheon, at New York's Hotel Biltmore, 300 editors and other representatives of the technical press, newspapers and general magazines, were guests of the General Electric Co. We were there to hear company officials tell the story of "G.E.'s" unique innovation in industrial marketing—a special streamlined train which is to tour the nation as the world's longest electrical show-room.

Known as "The More Power to America Special," this 10-car train, especially built for General Electric and drawn by a two-unit "Alco-G.E." diesel-electric locomotive, (a scintillating quarter-mile-long show-room and exhibit hall of 2,000 different electrical products and techniques parked in Grand Central Station), was unveiled for the press to see and inspect.

The train, staffed by a trained crew of exhibit engineers, will tour America during 1950 and 1951, stopping over for display periods at every important industrial center for the purpose of extending the market for electrical equipment, and also with the objective of disseminating engineering "know-how" to American industry. As a matter of fact the impression gained by this writer, upon inspection of the train, was that the exhibits were equally as educational as sales promotional. Since this is so, and because there is no display of household or office appliances, the train will not be open to the general public. The plan is to issue advance notices and invitations to representatives of electric utilities, manufacturing and transportation industries, municipalities and the like.

The accompanying pictures reveal characteristic exhibits, a great number of which may be tested or operated by the visitor. It was astounding to see how much in the way of working models of equipment could be gotten into the 9 ft. width of the cars. The study and care given the arrangement can best be appreciated when learning that more than two years were devoted to plannig the train, and another year to its assembly, by the advertising and sales promotion divisions of



Artist Sketch of Car No. 9—Civic Improvement Equipment

G.E.'s Apparatus Department. It is believed to be the first thing of its kind ever to have been attempted.

One interesting feature of the train is the recently developed miniature "G.E." diesel-electric generator for lighting, heating (calrod units), air conditioning and operating the equipment in each car. One of these vest-pocket sized units fits under each car, rendering any part of the train non-dependent upon the diesel-electric locomotive for electric current. Another new "G.E." material used for the interior trim of the special is its laminated plastic "Textolite."

Atomic Power Explained

Amongst the more glamorous of the exhibits, one reveals the complete cycle by which atomic energy might be connected into useful power. The display illustrates the conversion process, tracing the uranium ore from the mines and refinery to the power and breeder reactor where the fuel releases its energy as heat, which may be carried from the reactor by liquid metal, and from there to the heat exchanger. Here the molten metal transfers the heat to water in tubes to produce superheated steam. The steam thus generated is not radio-active and can be sent directly to turbine generators for production of electricity.

Another exhibit shows the production of ultrasonic sound waves of extremely high frequency. These waves admitted to a vessel containing water caused the water to act as if boiling. The visible vapor rising was drawn into an adjoining chamber containing a miniature village, where it was precipitated in the form of a miniature snow fall by the spraying of the "cloud" with dry ice from a miniature airplane. This exhibit bears the label, "Project Cirrus."

Another display is a cutaway showing the interior of a full-sized, modern jet engine, the many parts of which can be inspected. These "G.E." J-47s are used in powering U. S. Air Force planes with records of 671 mph. Component parts of guided rockets, which attain speeds of 3,500 to 5,000 mph. and reach heights of 100 to 250 miles above earth surface, were on display, also.

One car (No. 9) is devoted almost entirely to civic improvements, including water and sewage works equipment.

Any of you readers who do not get yourself an invitation to visit G.E.'s "More Power to America Special," when it reaches your neighborhood, will be missing something worthwhile. This writer can guarantee that you will spend an interesting two hours between the cab of the two-unit Alco-G.E. Diesel, and when you step off of the rear platform of the train. If you stop often to operate equipment, keep your eye on the time, as you may get home to a cold supper —and, you know what.

"DOES WATER NEED QUALITIES BEYOND MERE PURITY?"

WRITING under the caption, "Water May Need Qualities Beyond Mere Purity," Neil M. Clark in the December 25th, 1948 issue of the *Saturday Evening Post*, raises some provocative questions, created by the following interesting story of an observant and inquisitive farmer. This farmer, and expert livestockman, had noticed that cattle drinking one kind of water gained weight and did better, generally, on the same feed rations than did the same grade of cattle drinking another kind of water. His question was "why?"—but, let author Clark relate his own story as reprinted from the *Saturday Evening Post:*

"A Kentucky farmer named Herschel Weil, who lives in Lexington, made an odd discovery. Cattle that he was fattening for market on one farm made a daily gain of 1.4 pounds per animal. Those that he was fattening on another farm, near by, made a daily gain of 2.1 pounds per animal. All the cattle came from the same Texas ranges. They were fed the same, cared for alike. Yet one bunch fattened fast enough to make them profitable, the others didn't. Why?

"There was only one difference he could see, in the way two bunches of cattle were treated. The good-gaining ones drank from a limestone spring and from a deep well: they preferred the well water. The poor-gaining ones drank from a rain-water pond and from troughs of city water. It was but natural for Weil to think that something in the water was responsible. But what? He gathered samples from all the places and had the samples analyzed at the university. He learned that the well water, which the cattle liked and throve on, contained a larger percentage of minerals, particularly sulphur. Was that it?

"Weil is curious and persistent. He began asking doctors, nutritionists and research experts for answers. He soon discovered that nobody knew.

"To Weil, this seemed ominous. If water, he asked himself, is so important to cattle, why not to humans? It is known today that soils may be healthful or unhealthful because of minerals they contain or lack, and people living on those soils may be, in turn, healthy or unhealthy. But people take in water as well as food, perhaps more water than food. Is it important, Weil asked, what kind of water it is? Is water good enough if it's just wet? What, in short, makes good water good, and bad water bad? Cities, Weil considered, spend millions taking out bad things like the typhoid bacillus, and do a wonderful job of providing safe water. Could they conceivably take out too much?

"Weil laid questions like that before experts and still hasn't learned much. The experts don't know.

Drinking Water Too Much of a Closed Book

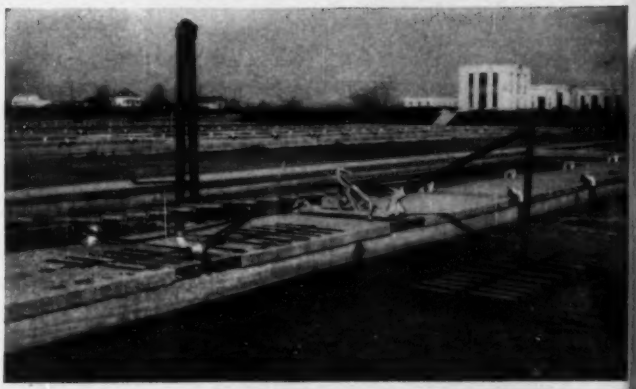
"The whole problem of drinking water today is entirely too much of a closed book. It has been assumed that 'water is water,' whether it comes from an unsullied mountain spring or a city tap. We have insisted on purity, and we like our 'pure' water cold and relatively tasteless. Beyond that, we haven't inquired much about what we pour down our throats a dozen times a day. Does water have a positive nutritional role? Many nutritionists think so. Does it make any difference what elements are in it, beyond H_2O? An increasing number of physicians think so. As for actually knowing just how it works, we're about where we were a half century ago with food."

Here is an immense and practically untouched field for exploration. Doctors, dentists, biochemists, nutritionists, water purification experts—all need more exact knowledge about the most desirable composition and the essential bodily functions of water. Millions have been spent in arriving at a better understanding of the effect of water quality on the well-being of metallic pipes, and methods of rendering water of quality which is best for the health of distribution piping systems. Perhaps it is time that some more adequate consideration be given the matter of the composition of water as it affects the animal and human system.

THE OVERWHELMING MAJORITY *specified* "CHICAGO" SWING DIFFUSERS AND PRECISION TUBES

Sewage Treatment Plant
Columbus, Ohio

Paul A. Uhlmann & Associates
ENGINEERS



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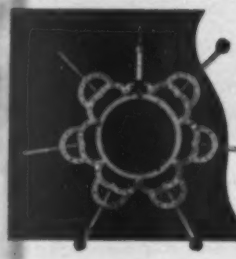

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MEETINGS SCHEDULED

JUNE 1—WORCESTER, MASS. (Hotel Sheraton)
New England Sewage Works Association. Sec'y, Walter E. Merrill, 511A State House, Boston, Mass.

JUNE 4-9—CHAPEL HILL, N.C.
North Carolina Water Works Operators' School. (School of Public Health.) Ass't. Dir., Clifford Pace, Institute of Government, Chapel Hill, N. C.

JUNE 5-9—COLUMBIA, MO. (University of Missouri)
Missouri Short Course. Director, Prof. Lindon J. Murphy, Univ. of Missouri, Columbia, Mo.

JUNE 5-10—GAINESVILLE, FLA. (Univ. of Florida)
Florida Annual Water & Sewage Short School. Director David B. Lee, P. O. Box 210, Jacksonville, Fa.

JUNE 5-15—STATE COLLEGE, PA. (Pa. State College)
Short Course on Flow Measurement. Chairman, Dr. Andre L. Jorissen, Assoc. Prof. Civil Eng., Pa. State College State College, Pa.

JUNE 7-9—AUBURN, ALA. (Alabama Polytechnic Institute)
Alabama Water & Sewage Works Association. Sec'y, Alex O. Taylor, Alabama Polytechnic Institute, Auburn, Ala.

JUNE 9-10—INDIANAPOLIS, IND. (Hotel Lincoln)
Central States Sewage Works Association. Sec'y, Paul W. Reed, 1098 W. Michigan St., Indianapolis 7, Ind.

JUNE 12-13—JAMESTOWN, N. Y. (Hotel Jamestown)
New York Sewage and Industrial Wastes Assn. (Spring Meeting.) Sec'y, R. C. Sweeney, 119 E. Main St., Rochester 4, N. Y.

JUNE 14—KITTERY, MAINE
Maine Water Utilities Assn. Sec'y, Earle A. Tarr, Supt. Water District, Winthrop, Me.

JUNE 19-23—STATE COLLEGE, PA. (Pa. State College)
Pennsylvania Sewage Works School.

JUNE 26-30—STATE COLLEGE, PA.
Pennsylvania Water Yorks School. Director, R. E. Stiemke, Pa. State College, State College, Pa.

JUNE 26-28—CAMBRIDGE, MASS. (Mass. Inst. Technology)
New England Industrial Wastes Conference. Director, Prof. Rolf Eliassen, Mass. Inst. of Technology, Cambridge, Mass.

JUNE 28-30—CINCINNATI, OHIO (Gibson Hotel)
Ohio Sewage & Industrial Wastes Treatment Conference. Sec'y, G. A. Hall, 302 Dept. of State Bldg., Columbus, Ohio.

JUNE 29—DOVER, N. J. (Germania Park)
New Jersey Section A.W.W.A. (Clambake and Outing) Inspection Trip, Lock Joint Pipe Co., Wharton, N. J. Sec'y, C. B. Tygert, Box 178, Newark, N. J.

AUG. 9—MT. DESERT ISLAND, ME.
Maine Water Utilities Assn. (Summer Meeting) Sec'y, Earle A. Tarr, Supt. Water District, Winthrop, Me.

AUG. 21-23—STATE COLLEGE, PA. (Nittany Lion Inn)
Pennsylvania Water Works Operators Assn. Sec'y, Prof. Robert E. Stiemke, Dept. of Engineering, State College, Pa.

AUG. 23-25—STATE COLLEGE, PA. (Nittany Lion Inn)
Pennsylvania Sewage & Industrial Wastes Assn. Sec'y, B. S. Bush, Penna. Department Health, Kirby Health Center, Wilkes-Barre, Pa.

SEPT. 6-8—ST. PAUL, MINN. (St. Paul Hotel)
Minnesota Section A.W.W.A. Sec'y, R. M. Finch, 518 Metropolitan Life Bldg., Minneapolis, Minn.

SEPT. 7-8—SARANAC LAKE, N. Y. (Saranac Inn)
New York Section A.W.W.A. (Fall Meeting) Sec'y, R. K. Blanchard, 50 West 50th Street, New York, N. Y.

SEPT. 14-15—HUNTINGTON, W. V. (Hotel Pritchard)
West Virginia Sewage and Industrial Wastes Assn. Sec'y, A. H. Paessler, 815 E. Franklin Street, Richmond 19, Va.

SEPT. 18-21—POLAND SPRING, ME. (Poland Spring House)
New England Water Works Association. (Annual Convention) Sec'y, Joseph C. Knox, 204 Tremont Bldg., Boston, Mass.

MEETINGS SCHEDULED

SEPT. 19-21—DAVENPORT, IOWA (Hotel Blackhawk)
Iowa Sewage Works Association. Sec'y, Leo Holtkamp, E. Ohio Street, Webster City, Iowa.

SEPT. 20-22—ATLANTA, GA. (Georgia Institute Technology)
Georgia Water and Sewage School. Sec'y, Van P. Enloe, R.F.D. No. 5, Box 363, Atlanta, Ga.

SEPT. 26-29—ATLANTIC CITY, N. J. (Claridge Hotel)
Pennsylvania Water Works Association. Sec'y-Treas., C. M. Hartman, 510 Telegraph Bldg., Harrisburg, Pa.

SEPT. 27-29—SANTA FE, N. M5. (LaFonda Hotel).
Rocky Mountain Sewage Works Association. Sec'y, C. H. Coberly, Room 329, 1441 Welton St., Denver, Colo.
Rocky Mountain Section A.W.W.A. Sec'y, Geo. J. Turre, Room 120, City-County Bldg., Denver, Colo.

OCT. 1-3—ST. LOUIS, MO. (Sheraton Hotel)
Missouri Section A.W.W.A.
Missouri Water & Sewage Conference. Sec'y, Warren Kramer, State Office Bldg., Jefferson City, Mo.

OCT. 9-12—WASHINGTON, D.C. (Statler Hotel)
Federation of Sewage Works Association. Exec.-Sec'y, W. H. Wisely, 325 Illinois Bldg., Champaign, Ill.

OCT. 11—WATERVILLE, ME.
Maine Water Utilities Assn. (Marks the 25th Anniversary of founding of the Ass'n.) Sec'y, Earle A. Tarr, Supt. Water District, Winthrop, Me.

OCT. 11-13—MOBILE, ALA. (Battle House Hotel)
Alabama-Mississippi Section A.W.W.A. Sec'y, J. L. Snow, 601 First National Bank Bldg., Montgomery, Ala.

OCT. 15-18—NEW YORK CITY, N.Y.
American Public Works Association Congress. Exec., Director, Donald Herrick, 1313 East 60th St., Chicago 37, Ill.

OCT. 15-18—NEW ORLEANS, LA. (Roosevelt Hotel)
Southwest Section A.W.W.A. Sec'y, Leslie A. Jackson, Robinson Memorial Auditorium, Little Rock, Ark.

OCT. 16-18—PITTSBURGH, PA. (Hotel Wm. Penn.)
Engineers' Society of Western Pa. Chairman, W. J. Murdoch, Hotel Wm. Penn, Pittsburgh, Pa.

OCT. 24-27—SAN DIEGO, CALIF.
California Section A.W.W.A. (Annual Meeting) Sec'y, Wm. W. Aultman, Box 38, LaVerne, Calif.

OCT. 26-27—DETROIT, MICH. (Detroit Leland Hotel)
Michigan Section A.W.W.A. Sec'y, T. L. Vander Velde, 2609 E. Saginaw St., Lansing 12, Mich.

OCT. 26-28—ATLANTIC CITY, N.J. (Hotel Madison)
New Jersey Section A.W.W.A. Sec'y, C. B. Tygert, P. O. Box 178, Newark, N. J.

NOV. 1-3—WILMINGTON, DEL. (DuPont Hotel)
Chesapeake Section A. W. W. A. Sec'y, C. J. Lauter, 5902 Dalecarlia Place, Washington 16, D. C.

NOV. 6-7—RICHMOND, VA. (Jefferson Hotel)
Virginia Section A.W.W.A. Sec'y, W. H. Shewbridge, 713 State Office Bldg., Richmond, Va.

NOV. 13-15—DURHAM, N.C. (Washington Duke Hotel)
North Carolina Section A.W.W.A. and North Carolina Sewage Works Association. Sec'y, E. C. Hubbard, State Board of Health, Raleigh, N. C.

NOV. 12-15—FT. LAUDERDALE, FLA. (Governor's Club Hotel)
Florida Section A.W.W.A. Sec'y, A. E. Williamson, Jr. P. O. Box 1431, Daytona Beach, Fa. (Joint Session with) **Cuban Section A.W.W.A.** Sec'y, L. H. Daniel, Barratillog 9, Havana Cuba (and) **Florida Sewage Works Association.** Sec'y, Perry Teeple, P. O. Box 210, Jacksonville, Fla.

NOV. 16—BOSTON, MASS. (Hotel Statler)
New England Water Works Assn. Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston, Mass.

NOV. 17-19—MESA, ARIZONA
Arizona Sewage & Water Works Association. Sec'y, Helen Rotthaus, San. Eng. Div., State Capitol, Phoenix, Ariz.

DEC. 21—BOSTON, MASS. (Hotel Statler)
New England Water Works Assn. Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston, Mass.

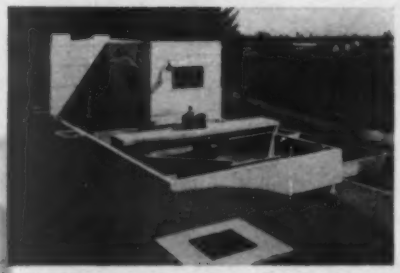
GROUND-KEY WORK
Noted for service since 1890
K-1012
After years in the ground, Glauber ground key valves turn as freely as when installed. Every Glauber fitting features a precision valve taper and water-tight bearing surface . . . protected against excessive heat and cold by Glauber's own special valve grease formula.
GLAUBER BRASS INC.
KINSMAN, OHIO
GLAUBER RED BRASS
GROUND-KEY CURB and CORPORATION STOPS
LEAD GOOSENECKS and WATERWORKS FITTINGS

Here's your Catalog
for grating and stair treads
BLAW-KNOX
Full of applications, specifications and engineering data that will help solve your grating problems
Send for your copy TODAY WHATEVER your grating problem . . . flooring, catwalks, stair treads, bridge surfacing, sidewalk doors, subway gratings, or any of the hundred and one uses for any industry . . . you'll want this big new Bulletin for complete information on construction details and all the advantages of Blaw-Knox Steel Gratings. Ask for Bulletin 2296.
BLAW-KNOX DIVISION
of Blaw-Knox Company
2051 Farmers Bank Bldg., Pittsburgh 22, Pa.
BLAW-KNOX ELECTROFORGED STEEL STAIR TREADS
Designed for tremendous strength against impact. Available with rolled diamond checker plate nosing (illustrated); twisted crossbar nosing; or abrasive nosing.
BLAW-KNOX ELECTROFORGED STEEL GRATING

Ideal for small communities, isolated institutions, outlying plants

YEOMANS SEWAGE TREATMENT PLANTS

. . . Activated Sludge Process or Biological Trickling Filter



The "PACKAGE" AERIFIER

Many small communities and outlying institutions, compelled to purify wastes but lacking an ample supply of diluting water, have found in the Yeomans "Package" Aerifier an ideal answer to a critical problem.

Compact, exceedingly efficient in purification, unique for low construction and operation costs, this activated sludge plant provides aeration and final sedimentation in a single concrete unit. Operation is as simple as possible, with supervision limited to routine check-up. Every installation includes final adjustment, initial tested operation, thorough training of operators and continuing counsel from Yeomans engineers.

"WATER-WHEEL" DISTRIBUTOR

Operating in conjunction with a primary sedimentation tank, the Yeomans "Water-Wheel" Distributor applies settled sewage to a trickling filter—with unfailing dependability. Sewage flows into the rotating trough, and is spread evenly on the filter bed through V-notches and spreader plates. The trough is actuated by a water-wheel and bevel gearing. Filter beds range from 5-foot to 25-foot diameters; and the entire area is effective for treatment. Continuous positive distribution is assured at all rates of flow—which does away with need for dosing chambers and siphons. There is none of the clogging and cleaning of spray nozzles often required with reaction distributors; and elimination of accessories saves as much as the entire cost of the complete Water-Wheel installation. Maintenance is extremely simple. Numerous Water-Wheel plants—small communities, hospitals, airports, industrial plants—provide impressive proof of this unit's extraordinary efficiency.

Helpful engineering data on these Yeomans plants will be sent promptly upon request—no obligation.

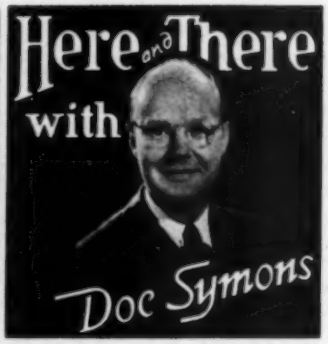
YEOMANS

PUMPS FOR BUILDINGS, MUNICIPALITIES, INDUSTRIAL APPLICATIONS—
and a complete line of Sewage and Waste Treatment Equipment

Yeomans Brothers Company
1433 North Dayton Street, Chicago 22, Illinois

Please send information as follows:
☐ Yeomans "Water-Wheel" Distributor
☐ Yeomans "Package" Aerifier

Name_____
Address_____
City_____ State_____



Here's **T**hat **M**an **A**gain—And this time, let's get right to the business at hand.

* * *

It was an honest mistake!—Some years ago, R. V. (Dick) Ford, (Philly Vice President of Ford Meter Box Co., Wabash, Ind.) was making calls in South Carolina. This particular day, he arrived in a small town just after lunch. Dick called his prospect's office and was told to call Mr. Mills at home. He did. Mr. Mills insisted that Dick come out to the house. Dick boarded the bus, got off at the right corner, walked four houses down and knocked at the door.

A pleasant man answered the knock, invited Dick in, took his hat, asked him to have a chair and began an interesting conversation. Perhaps a half hour later Dick said, "Now Mr. Mills, about those meter boxes—."

"Mr. Mills?" the man said incredulously, "He lives next door!"

* * *

Things I'd like to know—What is the origin of the expression, "between the jigs and the reels"? and "How many telegraph poles are there per mile along a railroad? (On the average, that is.)

* * *

Operator's Problems. — What would you do, if you were walking into a sludge pumping station some night, and suddenly from overhead and behind, a long slithering black snake dropped down and coiled itself around your neck? Thos. L. Manning, operator at the Ft. Dix, N. J. Sewage Plant, yelled—wouldn't you?

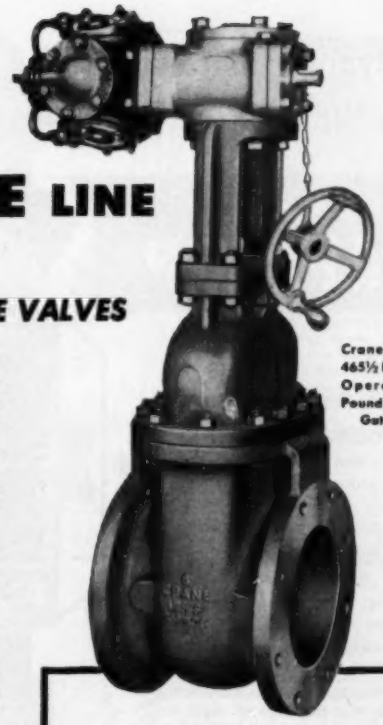
* * *

How to Get a Job!—It was a warm summer day and three young men sat on a lounge waiting to be interviewed for a job. A man came in and said to the first interviewee: "Mr. B. is ready to see you now; bring your hat and briefcase as you won't be coming back here."

(*Continued on page 74A*)

ANSWER TO A SPECIFIC NEED NOW IN THE CRANE LINE

NEW, LOW-COST FLUID-MOTOR OPERATED GATE VALVES



Crane 8-inch No. 465½ Fluid-Motor Operated 125-Pound Iron Body Gate Valve.

These valves fill the need for a power-actuated pipe line control at lower than usual cost. By utilizing a simplified fluid motor, they permit wider application of mechanically-operated valves to increase plant efficiency.

Low in first cost . . . low in operating cost . . . Crane Fluid-Motor Operated Valves save labor, help prevent accidents and offer definite advantages when installed on hard-to-reach valves or on valves used in timed operating cycles.

OPERATE AT LOW COST—Crane Fluid-Motor Operated Gates utilize pressure sources readily available in most plants—compressed air, water, or oil . . . at pressures ranging from 40 to 300 psi.

HIGH STARTING TORQUE—Motor is reversing type and is designed to exert greater torque when unseating the valve than when seating it. Added power to open valve against sticking is assured.

NO WASTE OF POWER . . . NO LOSS OF FLUID—Pressure-tight motor stalls when disc is in fully open or closed position. Motor can remain stalled indefinitely . . . under full pressure . . . with no leakage of operating fluid. No power is wasted in maintaining fluid at proper operating pressure.

Crane Fluid-Motor Operated Valves are now available in the following pressure classes, types and sizes:

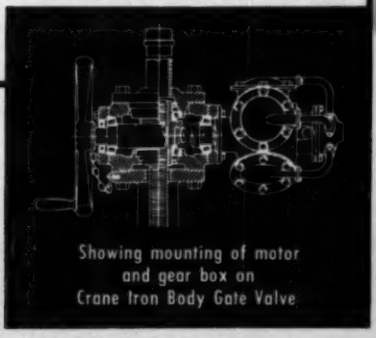
25-pound wedge disc gate	**12-in. to 30-in.**
125-pound wedge disc gate	**5-in. to 20-in.**
25-pound double disc gate	**10-in. to 30-in.**
100-pound W.O.G. double disc gate	**6-in. to 24-in.**
A.W.W.A. double disc gate	**4-in. to 20-in.**
Pulp Stock Valves	**8-in. to 20-in.**

Send for this descriptive folder—See how Crane Fluid-Motor Operated Gate Valves can help increase the operating efficiency of *your* plant. Ask your Crane Representative for your copy, or WRITE FOR FOLDER AD-1803. No obligation.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

How Crane Fluid-Motor Works

Radial-type motor has five diaphragm sealed chambers. Operating fluid, admitted through a 4-way distributing valve, acts against diaphragms to exert force against pistons. The pistons, in turn, transmit the thrust to an eccentric which causes drive shaft to rotate. Hammerblow device in gearbox allows motor to attain speed before loading and provides impact to overcome friction of valve parts.



Showing mounting of motor and gear box on Crane Iron Body Gate Valve

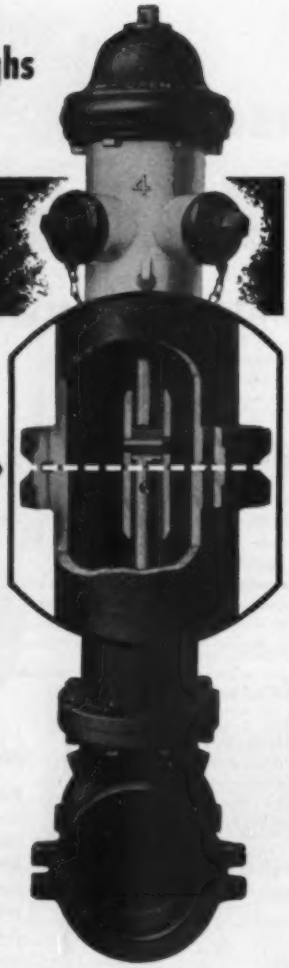
EVERYTHING FOR EVERY PIPING SYSTEM

CRANE

VALVES • FITTINGS • PIPE • PLUMBING AND HEATING

The Hydrant that Laughs at Traffic Hazards

KENNEDY
SAFETOP



As tough as they come . . .

but when it breaks, it's as clean as a whistle . . . at ground level.

yet, it's back in service in twenty minutes.

The safety breakable section of a KENNEDY Safetop Fire Hydrant will take all the punishment that a standard one-piece hydrant will. But when a couple of tons of flying steel hits it at high speed—and it's more than any hydrant can take—it breaks cleanly and evenly at ground level.

Within twenty minutes of arrival at the scene one man can have it back in service—no excavation—no water—no hoists—no costly replacements. A new breaking ring and a new stem coupling are all that are usually required.

Write for Bulletin No. 104

Where there is no traffic hazard install a KENNEDY Standard Hydrant with one-piece standpipe and stem

- The same minimum friction, maximum water supply design.
- The same positive drainage to protect against freezing.
- The same leak proof construction and ease of inspection . . . and all parts interchangeable with the SAFETOP except the standpipe and stem.

Write for Bulletin No. 38

THE KENNEDY VALVE MFG. CO.
1036 EAST WATER ST.
ELMIRA, NEW YORK
VALVES · PIPE FITTINGS · FIRE HYDRANTS

OFFICE-WAREHOUSES IN NEW YORK, CHICAGO, SAN FRANCISCO • SALES REPRESENTATIVES IN PRINCIPAL CITIES

(*Continued from page 72A*)

Some time later, the emissary from Mr. B. returned and the conversation with the second applicant went something like this:

"Will you come now and bring your hat and brief case."

"I don't have a hat."

"What do you mean, you don't have a hat?"

"I just don't wear a hat."

"Well, don't you think it would be rather undignified for you to make calls representing this organization and not have a hat?"

At this point the third interviewee spoke up and asked how much time he would have before being called.

"Oh, a half hour or so," replied Mr. B.'s emissary, whereupon the third man excused himself, walked out of the building, down the street, around the corner and into a shop.

Again, some time later, Mr. B.'s emissary returned and said, "Mr. B. will see you now, so bring your hat and your brief case. Harry Faber picked up his as yet unworn hat, went upstairs and got the job as Research Chemist of the Chlorine Institute.

Hm-m-m-m! Wonder if my boss knows that I don't wear a hat—in the summer, that is?

* * *

Up Canada way in April (Niagara Falls, Ont. to be exact), I attended the Canadian Section AWWA meeting and as always follows a trip to Canada, I came home with a hatful of pleasant memories—and stories.

At one of the luncheons I was sitting across the table from James Harrison, Chief Engr., Water Dept., Peterborough, Ont., who said to me, "Doc, I have two questions: First, who is Gin, and secondly, why do you use first names in your column; why don't you use last names, so we'll know about whom you are talking?"

Far be it from me to contradict "Jimmy" Harrison, but for at least three years now I have always mentioned the last name at least once in the item. If you must know, I call people by their first names, because I can't remember last ones. It's a quirk of my memory—and now the secret's out.

And Jimmy, I thought everyone knew that "Gin" is my girl. She's a strawberry blond I met when I was in college, and we're still going around together.

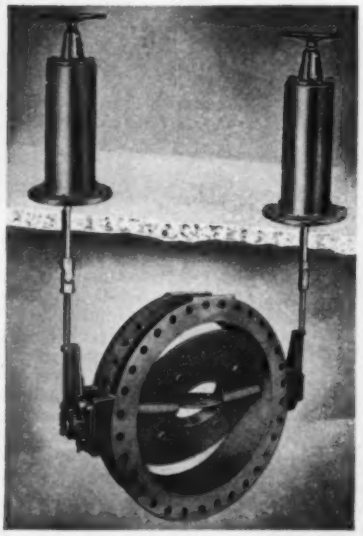
* * *

Let this be a lesson to you! If you sit on the baldheaded row at these convention entertainments, you're almost bound to get into the act. And

(*Continued on page 76A*)

R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •



No. 727

36 inch x 8 inch heavy duty dual valve with 125-pound Am. Std. flanges controls maximum flow with a small pressure drop in large 36-inch valve. By closing large valve, small inner 8-inch valve controls small flow with high pressure drop. Separate handwheel controls for each valve vane patented. Automatic control and drip tight rubber seat available.

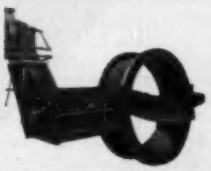
7 Advantages of R-S VALVES

1. Economy in first cost. Minimum number of working parts.
2. Body assemblies correctly engineered mechanically and metallurgically. Equal or exceed A.S.A. standards in every detail.
3. Only a few handwheel turns required for opening or closing.
4. Less inherent pressure loss reduces pumping costs.
5. More control rangeability. Readily adapted to automatic operation.
6. Self-cleaning—no pockets to capture sediment—no objectionable turbulence or wire drawing.
7. Rotary motion of shaft reduces stuffing box problems.

R-S PRODUCTS CORPORATION
Wayne Junction • Philadelphia 44, Pa.

No. 680—Standard heavy duty valve with handwheel control—self-locking worm and gear. Automatic control and rubber seat available with 125-pound flanges. Rubber seated valves are drip tight with water at 100 psig and air bubble tight at 80 psig under temperatures up to plus 275° F. and as low as minus 40° F.

No. 771—Heavy duty wafer type valve equipped with handwheel control—self-locking worm and gear. One-piece body casting. Vane, shaft assembly and handwheel control identical with double flanged valve. Face-to-face dimension does not reduce torque. Flareout on body casting accommodates large mounting bracket base same as No. 680.

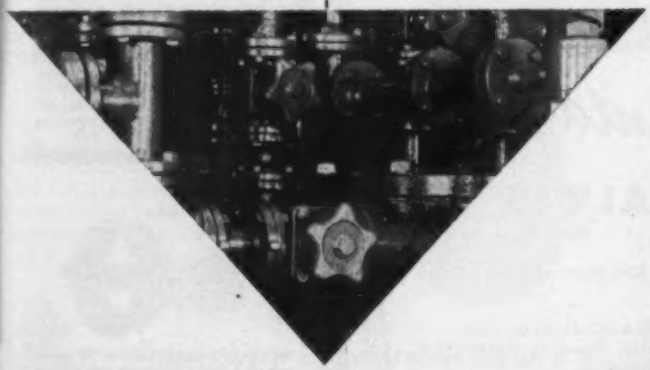


No. 734—72 inch 125 pound "H" metal valve for 800° F. Equipped with cooling fins, oil cylinder and positioner utilizing 200 psig operating oil pressure and 0-15 psig instrument air. Positioner cam driven simulating straight-line semi-log control curve or other characteristics if desired.

R-S field representatives maintain experienced engineering and maintenance staffs to study your valve problems, make recommendations and an appraisal of what you may expect from such studies. Specially trained factory representatives are also available for consultation.
Consult with your local R-S representative. Look for the address and phone number listed under "R-S Products, Valves" or write direct.

SARAN LINED steel pipe

means dependable protection against corrosion!



For the dependable protection against corrosion that assures you of long-term operation at a minimum maintenance cost—*specify saran lined steel pipe.* Saran's unusual resistance to most chemicals and solvents plays an important part in the reduction of shutdowns and lost production. Another noteworthy advantage is its ease of field fabrication—involving NO costly delays with special tools or handling. Saran lined steel pipe is available in maximum lengths of 10 feet and in sizes from 1 to 6 inches. Also available are saran lined diaphragm valves, plug valves, flanges, reducing flanges, flanged fittings, gaskets and fittings with union ends. Manufactured by The Dow Chemical Company, Bay City, Michigan, distributed by Saran Lined Pipe Company, Dept. TSP-34.

Distributed by

Saran Lined Pipe Company

701 STEPHENSON BUILDING • DETROIT, MICHIGAN

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SARAN LINED PIPE

DOW

product

(*Continued from page 74A*)

if DAVE GALLOWAY, of Industrial Pictures, Toronto, is around you'll probably get in the picture too, —as witness this one.

The blonde was the featured singer. Hm-m-m-m—not bad, not bad!! The two persons on the right are Mrs. Mae Groves of Dr. A. E. Berry's Ont. Dept. of Health office in Toronto, and Roy Aston (the chlorine dioxide expert) of Mathieson Chemical Corp. (I understand Roy is soon to be transferred to Cincinnati for bigger and better things Mathiesonwise).

The rose in the above picture is through the courtesy of Samuel F. Newkirk, Jr., Engr. Supt., Board of Water Commissioners, Elizabeth, N.J., now known as "Kissin' Sam" after assisting Ross (Peterborough, Ont.) Dobbin with the presentation of chinaware to the ladies at the banquet.

* * *

And speaking of photographs—*"Jim" Daly*, Editor, Engineering and Contract Record, Toronto, was around taking pictures with a new Land Polaroid camera. And just so you can see the front view of the guy with the rose, above, here's Jim's shot of a couple of Georges—George Morgan,

Vice President and Gen. Mgr. of Victaulic Co. Canada and club room host extraordinary, and of course, Very Truly Yours.

* * *

Once in a while I run a letter from a reader in this column, but this month I'd like to reverse the procedure and use a letter to a reader. Here'tis:

"W. H. Wisely, Exec. Sec'y., Fed. Sew. Wks. Assns., Champaign, Ill.—

Dear Homer: I was delighted to receive your letter stating that you had completed the work on the preparation of the 20-year Index of *Sew. Works Journal* (now known, I believe, as *Sewage and Industrial Wastes*). I am delighted, too, to have been associated with you on this project; I only wish that I could have shared the burden equally with you.

"Probably no one but me—and your family—will ever know just how many long and weary hours you put on the job both before and after my contribution. My family got thoroughly sick of seeing me hunched over index cards hour after hour—by comparison then your family must have been triple plus annoyed with seeing index cards around your study and you hunched over them.

"Well, I know two 'guys' who will never do another 20-year index. Just turning more than 22,000 pages several times is a job, while making out some five thousand or more subject entries to say nothing of distributing them was a chore and, of course, I'm not forgetting that you did all of the geographical and author entries by yourself.

"I know two fellows, also, who will not be satisfied with the job when it is published—there may be more—but I know one fellow (V.T.Y.) who liked the ideas you set up for this index so well that he copied a number of them in the Annual Ref. and Data index of *Water & Sewage Works*.—And if any one should tell you that I am trying to give you all the credit for the success of this venture on the part of the Federation, they are so right. Thanks again, Homer, for letting me do a little of the work.

"Oh, yes, I understand that this 20-year index to S.W.J. will be available in September.—V.T.Y.—Doc."

* * *

Something new has been added—Nice, too!—Messrs. Gillette and Enslow recently gave me a brand new title and then added a shiny new contract for another year, plus the privilege of being around the country occasionally on *my own* business.

* * *

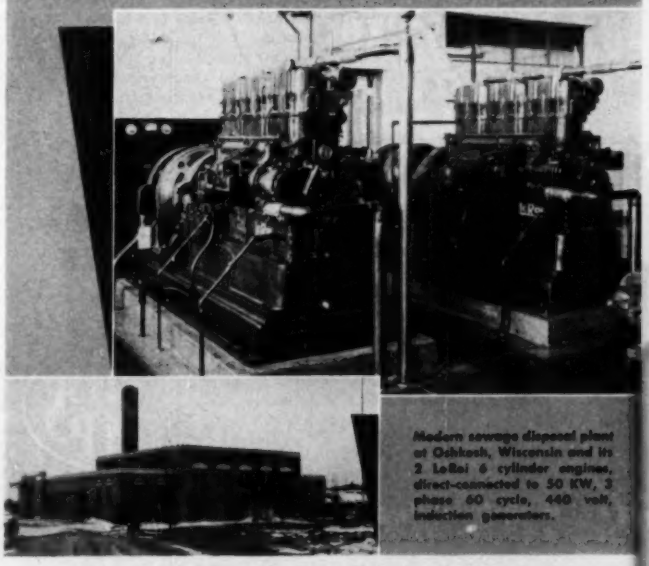
And next month we'll have some comments on the AWWA Convention at Philadelphia.

V.T.Y.—Doc

There would be no housing shortage if it were as easy to lay bricks as to throw them.

LE ROI MILWAUKEE

Saves 6 times initial cost in 12 years of continuous service!



Modern sewage disposal plant at Oshkosh, Wisconsin and its 2 LeRoi 6 cylinder engines, direct-connected to 50 KW, 3 phase 60 cycle, 440 volt, induction generators.

Here's proof that Le Roi Engine Generator Sets save taxpayers' money!

In Oshkosh, Wisconsin, two Le Roi engine-generator units operating on "no-cost" sewage gas produce electric power at a cost of .398¢ per kwh. This extremely low cost includes charges for labor, insurance, depreciation, and repairs. Purchased power at the utility rate would be 1.507 cents per kwh. Using Le Roi results in actual savings of nearly $4000 a year for taxpayers!

Lubricating oil, repair parts, and labor cost less than $600 a year for these two twelve-year-old engines. This is real evidence of Le Roi long-life and dependability.

Le Roi engines are available in sizes ranging from 6 to 600 hp — custom generator sets in sizes from 30 to 300 KW. They operate on no-cost sewage gas, natural gas, butane, or gasoline. Lighten the tax load in your community. Investigate the advantages of Le Roi low-cost power. Send the coupon below for a detailed report of this and other money-saving installations.

LE ROI COMPANY

Milwaukee 14, Wisconsin

New York • Washington • Cleveland • Birmingham

Tear out this coupon and mail TODAY!

LE ROI COMPANY MILWAUKEE 14, WISCONSIN

Please send me complete information on the Oshkosh, Wisconsin Le Roi Engine installation plus other cost-cutting job reports.

Name.....

Title.....

Address.....

City.....( ) State.....

B-67

MANUFACTURERS' and EQUIPMENT NEWS

601

"Scooter" Earth Borer

Hydrauger Corp., San Francisco, Calif., has developed a 150 pound machine that will be known as the "Scotter Model" Hydrauger. New features of this fast earth boring machine are a full length sled mount and an air driven cable winch which pulls the entire machine along as it advances the boring bit forward into the ground. Rapid boring of both 2 and 2½-in. holes is accomplished by means of rock, hardpan or clay type bits and up to seventy feet of drill stem can be laid out ahead of the machine. This is pulled into the earth formation by means of the winch and cable.

This new model, using both air and water, has a built-in pressure water pump for 110 psi. non-clogging water circulation and can work successfully in positions too cramped for any other type of installing machine.

For further information on this new earth-borer, mail a Reader Service Card on which is entered the above key number and your name and address.

DIESEL POWERED MUNICIPAL PUMPING STATION REPORTS PUMPING COSTS CUT 25%

Three New Pumps Replace One Old

The age of the damaged pump and high cost of repairs militated against any attempts to put it back in operation, and thus the decision was made to replace it with the three horizontal centrifugal pumps. The pumps selected were Peerless Pumps, characterized by the occurrence of normal operation in the 87% efficiency range. Normal operation, dictated by the top level of elevated storage, is at 67 pounds' pressure and 2,500 gpm.

Reprinted from American City Magazine, February, 1950

87% EFFICIENCY RANGE CHARACTERIZES PEERLESS PUMP INSTALLATION FOR EASTERN CITY

Municipalities count high efficiencies over extended pumping periods as only one reason for their acceptance of Peerless centrifugal pumps. Dependability, ease of maintenance, widest capacity range, quality construction set the Peerless standard for pump performance and operating economy. Look to Peerless for continued leadership in pumping water at measurable savings. Write today for Bulletin B-1300 describing and illustrating Peerless Type A horizontal pumps, shown installed in the photo above.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Factories: Los Angeles, California, and Indianapolis, Indiana
Offices: New York; Atlanta; Fresno; Los Angeles; Chicago; St. Louis; Phoenix; Dallas, Plainview and Lubbock, Texas.

Timely Portfolio on Advantages of Complete Metering

A Matter of Policy vs Profligacy in Water Supply

The widespread water shortage has prompted the Pittsburgh Equitable Meter Division, Rockwell Manufacturing Co., to develop a portfolio of educational aids citing the advantages of metering all water services.

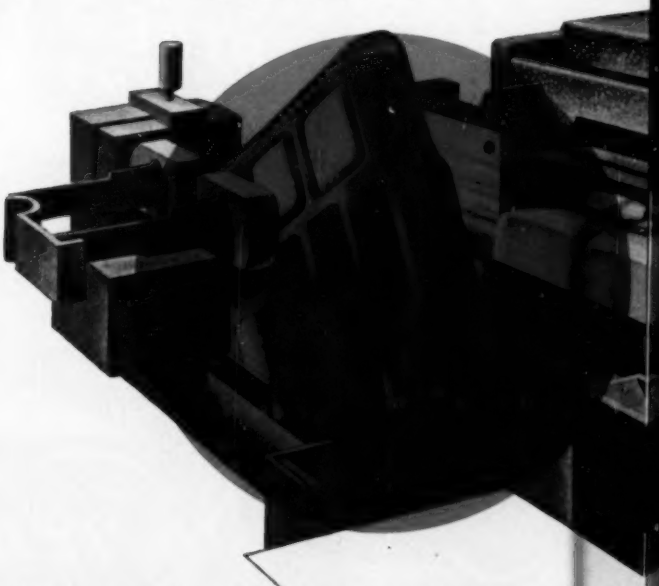
The purpose of this program is to demonstrate that many municipalities have an adequate supply of water which has become "inadequate" primarily because of needless waste. It is designed to show that extravagant usage and wastage only occur where water is sold on other than metered rate basis.

The Rockwell portfolio includes the following: (1) Reprints of prize-winning essays on the advantages of 100 per cent metering; (2) Publicity stories on meters and the advantages of metering; (3) Water

(*Continued on page* 80A)

as you were in 1900

Many soap-making operations were done by hand; so were some of the processes involved in paper, textile and glass manufacturing as well as water purification and sewage treatment.



as you are today

Sanitary, efficient machine operations replace the old hand processes in soap manufacture.

...with 50 years of research by Niagara Alkali

Gigantic kettles four stories deep... capacities as high as 175 tons... these are the superlatives in which soap-makers are planning—and working —today. Every step in soap manufacture is absolutely controlled to assure a uniform and superior product.

Niagara Alkali, now observing its 50th anniversary, is likewise able to assure the uniformity and superiority of its products—the result of continuous research to achieve product control and efficiency. The success of this research is reflected in Niagara's ability to serve many fields well: paper, soap, glass, textiles, sewage treatment, water purification and others.

NIAGARA ALKALI COMPANY

60 East 42nd Street, New York 17, N. Y.

Liquid Chlorine • Caustic Potash • Carbonate of Potash • Paradichlorobenzene • Caustic Soda
Niagathal (Tetrachloro Phthalic Anhydride) • NIALK TRICHLORethylene

WARREN
Solves Your
PIPE
PROBLEMS
BELL & SPIGOT PIPE •
FLANGE PIPE •
MECHANICAL JOINT PIPE •
FLEXIBLE JOINT PIPE •
SPECIAL CASTINGS •
SHORT BODY BELL & SPIGOT SPECIALS •
Warren Cast Iron Pipe and Fittings can be supplied in all sizes 2" to 84" with all types of joints and in accordance with Standard Specification. Specify "Warren Pipe" for your next job.
Take advantage of our large stock of non-standard patterns, when in need of special castings to meet your individual requirements.
Warren
FOUNDRY & PIPE CORP.
55 LIBERTY ST. — N. Y. C.
WARREN PIPE CO. of MASS. INC.
75 FEDERAL ST., Boston, Mass.

STOP
JOINT LEAKAGE
USE
CARSON CLAMPS
With Pearlitic C.I. Bolts for Cast Iron Pipe and Fittings.
Write for Prices.
Carson-Cadillac Co.
1221 PINSON ST. BIRMINGHAM, ALA.

(Continued from page 78A)

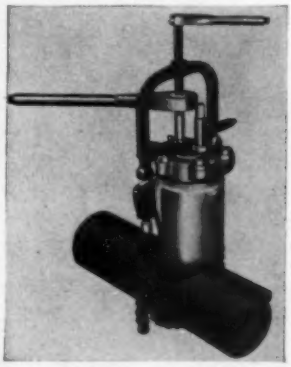
waste postcards illustrating how water is wasted through common defective plumbing and leaks and (4) Case histories of actual "before and after" metering exteriences in municipalities of varying size.

All of this material is available to water works men, upon request, for use in promoting the idea of meters to municipal authorities and consumers. Write to Pittsburgh Equitable Meter Division, Rockwell Manufacturing Co., Pittsburgh 8, Pa. Or, just fill out one of the Reader Service cards in this issue with the words "Metering Results" in the key box.

602

Tapping Machine

The Hays Manufacturing Co., of Erie, Penna., has produced a new tapping machine that makes it possible to install corporation stops faster



then heretofore, with more taps per tool and less physical effort.

The Hays Model "B" is designed to drill, tap and install the corporation stop, from ½ in. through 1 in., practically in a single operation, without disassembly of the machine during the complete operation, and under full pressure. The machine is fully loaded before it is installed on the main.

For complete information as to operating details, etc., mail a Reader Servicec Card on which is entered the above key number and your name and address.

Graver Appoints Charbonneau

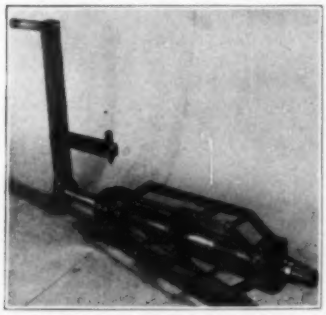
Graver Water Conditioning Co., Division of Graver Tank & Mfg. Co., Inc., New York, N.Y., announces the appointment of Tom Charbonneau as Florida Representative. For many years has been engaged in sales and supervising work on treatment of boiler feed-water, consulting work on waste recovery, municipal water plants. Mr. Charbonneau will make his headquarters at 305 W. Colonial Drive, Orlando, Fla.

603

Portable Tenon Tool

H. D. Fowler Co., Seattle, Wash., announces a new Spring Load tool for tenoning asbestos cement and wood pipe on the job. A companion tool to the Spring Load A-C pipe cutter the tenon tool is designed to tenon any length pipe with diameters up to 20 in. and will produce close tolerance, chatter-free cuts as

far back as 6 in. from the end of the pipe. This tool eliminates the need for machine shop work and is light-



weight, simple in design and can be used on the job and adjusted in a matter of seconds.

If you desire further information on this new tenon tool, use a Reader Service Card on which is entered the above key number and your name and address.

U.S. Pipe and Fdry. Announce Changes

Announcement has been made by D. Birney Stokes, vice president in charge of sales of the U.S. Pipe and Fdry. Co. of several changes in sales personnel effective July 1, 1950.

Carl N. Brown, present western sales manager at Chicago will become assistant general sales manager. Mr. Brown has been active in the affairs of the Illinois section AWWA and has been Secretary of the section for the past several years.

Howard A. Hoffer, assistant general sales manager will henceforth be in charge of all export sales and eastern division sales.

Succeeding Mr. Brown as western sales manager will be Leslie J. Hart, who has been asst. western sales manager in the Chicago office. (Mr. Hart was also elected to serve as Secretary of the Illinois Section.)

Harry D. Wade, present Kansas City sales agent will become Asst. western sales manager, in Chicago and Thos. B. Irwin now in the Philadelphia office will become Kansas City sales agent.

604

Aluminum Manhole Steps

Aluminum Co. of America, Pittsburgh, Penna., is now marketing forged aluminum manhole steps and ladder rungs for municipal and industrial installations. Forged from Alcoa aluminum alloy 61S-T6 for high corrosion resistance and maximum strength, the steps come in three sizes, adaptable to concrete, brick or concrete block wall construction. Nonsparking characteristic of aluminum is particularly advantageous where explosive gases or dust may be present.

For further information regarding these new forged aluminum manhole steps, enter your name and address with the above key number on a Reader Service Card and mail to our Reader Service Dept.

Josam Elects Officers

Josam Mfg. Co., Cleveland, Ohio, announced election of four new officers at a recent meeting of the Board of Directors. The following members of the Josam organization were elected to office: A. L. Yeager—Vice Pres.

(Continued on page 82A)

▶▶▶▶ WRITE TODAY FOR THE 28 PAGE CENTRILINE CATALOG

CENTRILINE REDUCES PUMPING COSTS

HIGH CARRYING CAPACITY means low pumping costs. Centriline, by assuring perpetually sustained high carrying capacity, keeps the pumping expenditure a low item on the community budget.

Protective cement mortar linings, as applied by Centriline, are continuous, dense, smooth, and without variation in quality. This ever-smooth surface permanently resists corrosion and tuberculation so that pumping expense and depreciation costs go down; coefficient of flow and useful life increases!

Whether old mains are losing efficiency or new projects are planned it is wise to consider Centrilining for the sake of the municipal budget. Our competent staff of hydraulic engineers is ready to assist you at any time.

▶ PIPE LINING FACTS NO. 2 ◀

CENTRILINE CORPORATION

A subsidiary of Raymond Concrete Pile Co.

140 CEDAR STREET • NEW YORK 6, N. Y.

Branch Offices in all Principal Cities in the United States and Latin America.

CEMENT MORTAR LININGS FOR WATER MAINS

Centrifugally Applied In Strict Conformity with A. W. W. A. Specifications

* CARLON PLASTIC PIPE is the modern answer to water and sewage transmission problems. *Guaranteed forever* against rot, rust, and electrolytic corrosion, it has a trouble-free service life many times longer than ordinary pipe.

CARLON'S flexibility and extreme light weight provide for more rapid and economical installation. One man can lay long sections easily and then make connections in two minutes. Many fittings necessary for other pipe are completely eliminated.

CARLON will curve to follow a ditch line or surface contour, and it can be installed above or below frost level because its ratio of expansion exceeds that of freezing water.

Write today for additional information, or call BRoadway 6565 for immediate service.

CHECK CARLON SIZES • • LENGTHS • • WEIGHT • • STRENGTH

STD. SIZE	O.D.	I.D.	CALCULATED B.P. P.S.I.	WT./FT.	NORMAL SHIPPING LENGTHS
1/2"	0.840	0.622	540 lb.	0.102 lb.	400 ft. coils
3/4"	1.050	0.824	350 lb.	0.140 lb.	400 ft. coils
1"	1.310	1.079	300 lb.	0.181 lb.	300 ft. coils
1 1/4"	1.660	1.380	200 lb.	0.367 lb.	300 ft. coils
1 1/2"	1.900	1.610	200 lb.	0.330 lb.	250 ft. coils
2"	2.370	2.079	170 lb.	0.443 lb.	200 ft. coils
3"	3.504	3.070	165 lb.	0.91 lb.	100 ft. coils
4"	4.504	4.020	150 lb.	1.25 lb.	25 ft. str.
6"	6.630	6.070	115 lb.	2.23 lb.	25 ft. str.

CARLON CP

CARTER PRODUCTS CORPORATION
10132 Mooch Avenue
CLEVELAND 5, OHIO

(*Continued from page* 81A)

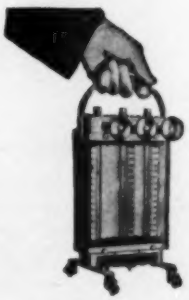
in Charge of Production and Engineering; M. R. McLaughlin—Vice Pres. in Charge of Sales; L. H. Polster—Vice Pres. and Asst. to the President, and Sadye R. Selman—Vice Pres. in Charge of Advertising.

Mr. Yeager joined Josam in 1938 and in addition to being Factory and Foundry Manager he has also been in charge of Engineering. Mr. McLaughlin became associated with the company ten years ago in the sales department and later became District Sales Manager. Mr. Polster spent several years as a Josam representative in Washington, D.C., and later was transferred to Cleveland and has been District Sales Manager since 1947. Miss Selman started with the company as a stenographer and advanced to Office Manager and became advertising manager approximately one year ago.

605

Research Kit

Brooks Rotameter Co., Lansdale, Pa., has developed a compact, portable kit with a wide flow range for research, pilot plant and field work. The kit has three integral metering tubes with two special floats for each tube made of pyrex and tantalum. The flow range of this meter is 0.1 cc/min. to 0.5 gpm of liquid and 5 cc/min. to 2cfm of air.



The unit can be equipped with brass or Type 316 stainless steel built-in needle control valves.

It is stocked in end fitting of steel, brass, aluminum, 303 and 316 stainless steel, hard rubber, nickel, monel, durimet, and hastelloy "C". Total weight of unit including self-supporting legs and carrying handle is 15 lb.

To obtain further information on this Research Kit, use a Reader Service Card on which is entered the above key number and your name and address.

(*Continued on page* 84A)

READER SERVICE CARDS for

WATER & SEWAGE WORKS

Equipment — Products
Information — Literature

JUST
CLIP
THESE
CARDS
MARK
AND
MAIL —
TO
RECEIVE
THE
LATEST
INFORMATION
OR
LITERATURE
DESCRIBED
IN
THIS
ISSUE

Place Stamp Here

WATER & SEWAGE WORKS
155 East 44th Street
New York 17, N. Y.

Reader Service

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WATER & SEWAGE WORKS
155 East 44th Street
New York 17, N. Y.

Reader Service

Write key number of item you desire here →

Your name .....

Title .....

Company or Dept. .....

Address .....

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WATER & SEWAGE WORKS READER SERVICE

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Title .....

Company or Dept. .....

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Company or Dept. .....

Address .....

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WATER & SEWAGE WORKS READER SERVICE

READER SERVICE CARDS HOW TO USE THEM

Please fill out a separate coupon for each item on which you desire information. This will greatly facilitate handling.

Key number is at head of each new product, item of equipment, catalog or bulletin, described in this issue.

Enter key number in box.

Please PRINT your name and title, company or department name, and your address

NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

PIPE CLEANING TOOLS AROUND the WORLD

OSLO, NORWAY—SINGAPORE, M. P.

★ All this debris taken from 10" pipe. Section shows perfect job.

WATER LINES

★ "Flexible Power Bucket Machines, Power Drive Rods and Tools make work easier in the Orient too.

SEWER LINES

"FLEXIBLES" IN OSLO AND SINGAPORE—AS WELL AS IN THE U. S. A.

"FLEXIBLE"

UNDERGROUND PIPE CLEANING CO. — **SEWER-ROD EQUIPMENT CO.**

9059 VENICE BOULEVARD, LOS ANGELES 34, CALIFORNIA

141 W. Jackson Blvd. Chicago, Ill.
401 Broadway New York 13
147 Hillside Ter. Irving, N. J.
P. O. Box 165 Atlanta
P. O. Box 445 Memphis, Tenn.
801 E. Excelsoir Blvd. Hopkins, Minn.
29 Cordon Ave. Roslindale 31, Mass.
Box 167 Los Nietos, Calif.
41 Greenway St. Hamden, Conn.
3786 Durango Ave. Los Angeles 34, Calif.
709 House Bldg. Pittsburgh 22, Pa.
4455 S. E. 24th Ave. Portland 2, Ore.
P. O. Box 447 Lancaster, Texas

THE SILENT WATCHMAN

DIXIE TANK AND BRIDGE CO.

3523 LAMAR AVE. — P. O. BOX 14

MEMPHIS 1, TENNESSEE

Complete Service for Elevated Water Tanks—
Nation Wide Service—30 Years Experience

KEEP THE SAFETY FACTOR IN YOUR TANK THE DIXIE WAY

By welding seams, pits and rivets which gives a riveted tank 15% more Safety Factor than it had when built. No rivets removed, water supply maintained while work is in progress. On completely reconditioned jobs, the painting is guaranteed for five years, repairs guaranteed for ten years, provided the tank is painted every five years. Yearly inspection, making all adjustments, if any, without additional cost.

Write Us for Free Copy of Publication

SOUND PRINCIPLES OF WATER TANK MAINTENANCE and TANK TALK, by W. A. RILEY

—SAFETY—SERVICE—SATISFACTION—

COPYRIGHT 1949

THE LARGEST ORGANIZATION OF ITS KIND GIVING SAFE MAINTENANCE AT LOW COST

(*Continued from page 82A*)

Kennedy Valve Buys Semler Co.

Kennedy Valve Mfg. Co., Elmira, N.Y., has announced the purchase of the Semler Co., Jeannette, Pa., manufacturers of Cast-Iron Pipe Fittings. Charles F. Kennedy, now president of both companies, reported that manufacturing operations would be continued at the Jeannette plant.

New officers of the Semler Company, which has engaged in the manufacture of cast-iron fittings since 1915, are Charles F. Kennedy, Pres., J. Lawrence Kennedy and Howard P. Semler, both Vice Presidents and Thomas S. Turkington, Controller.

Addition of the Cast-Iron Fittings to the present line of Malleable Iron and Bronze Fittings will broaden the Kennedy line.

606

Pipe Locator

Pathfinder Co., Pasadena, Calif., is offering a liberal trade-in allowance for practically any pipe locator now in use to introduce its new lightweight, high powered pipe locator called the Pathfinder. Operated by one man, it is simple to use and valuable in locating position and depths of buried tees, mains, gate valves,

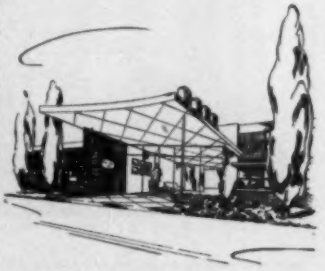
lost meters and meter boxes. Power switch is automatically turned off when the front and back panels are snapped together for transport or storage thus eliminating the chance of leaving the power on when not in use. Operated on standard miniature radio tubes, flashlight batteries and hearing aid cells with replacements obtainable anywhere.

For complete details and full information regarding this pipe locator, use a Reader Service Card on which is entered the above key number and your name and address.

Dorr Holds Open House

On Thursday afternoon, April 27th, The Dorr Co. was host to several hundred persons at an open house held in the new offices of the company at Stamford, Conn.

Located on Barry Place, the new offices cover some 38,000 sq. ft. of floor space all on one floor. Adequately lighted both by large windows and



TAKE INVENTORY—

of your chlorine gas feeders!

DOES YOUR EQUIPMENT control and meter chlorine gas in the dry, non-corrosive state — or do its vital parts, including the important inlet valve, require expensive maintenance because they operate in a corrosive, wet chlorine atmosphere ?

DOES YOUR EQUIPMENT work the same winter and summer — or do you need a hot water supply or temporary water heaters to overcome chlorine hydrate problems during cold-water seasons ?

DOES YOUR EQUIPMENT automatically prevent bothersome chlorine odors — or do you waste a lot of water to prevent trey-produced odors ?

DOES YOUR EQUIPMENT have an easy-to-seal chlorine flow-system — or do you have to check bothersome stuffing boxes and other leak-likely devices ?

DOES YOUR EQUIPMENT have a positive chlorine flow indicator — or does it have an indicator that shows "head" . . . that indicates flow even when no chlorine is being fed ?

BUILDERS Chlorinizers OK ON ALL COUNTS!

The extra features of Builders Chlorinizers look mighty good when you compare chlorine gas feeders. Be sure to get these features on your new or replacement equipment by specifying BUILDERS. For Bulletins and engineering information, address Builders-Providence, Inc. (Division of Builders Iron Foundry), 380 Harris Ave., Prov. 1, R. I.

BUILDERS PRODUCTS

The Venturi Meter • Propelofio and Orifice Meters • Kennison Nozzles • Venturi Filter Controllers and Gauges • Conveyofio Meters • Type M and Pio-Watch Instruments • Wheeler Filter Bottoms • Master Controllers • Chlorinizers — Chlorine Gas Feeders • Filter Operating Tables • Manometers • Chronofio Telemeters

130 YEARS 1820 BUILDERS 1950 BUILDERS IRON FOUNDRY

BUILDERS PROVIDENCE Instruments

overhead fluorescent lighting, and decorated and furnished in natural wood, the interior presents an attractive compliment to the modern entrance shown in the accompanying artists sketch.

Late in 1949, the Dorr Co. moved its general offices, formerly occupying two floors of the General Electric Co. Building in New York City to larger space in the Northam Warren Building in Stamford. The move to nearby Connecticut came as the culmination of a search of many years for general offices in a suburban location readily accessible to New York and to the company's research and testing laboratories at Westport, Conn.

According to Anthony Anable, Public Relations Director of the company, it is believed that the transfer of company headquarters to a locality less crowded than New York offers greatly improved living and working conditions and will prove a real contribution to the well-being of the staff as well as to the continued growth of the company. During the open house, there were two showings of the documentary film, The Dorr Way.

607

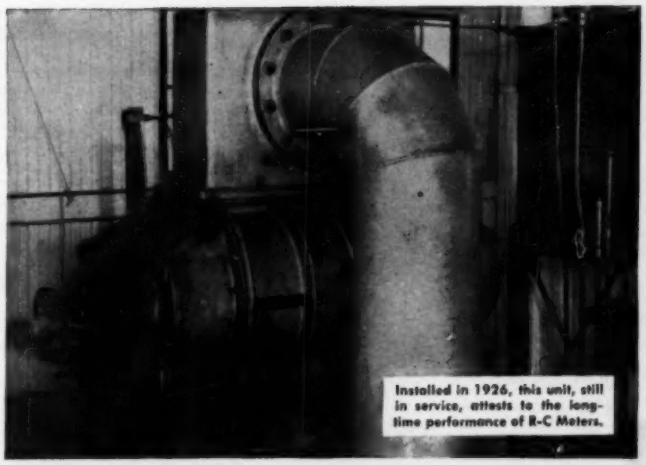
Pressure Measurement at Remote Reservoirs

Manning, Maxwell & Moore Co. in conjunction with Brown Industrial Division of Minneapolis-Honeywell Reg. Co., Minneapolis, Minn., has developed a new system that can measure pressure at long distances. Of especial value to municipalities whose reservoirs are located long distances from cities, this new measuring system will electronically record pressures up to 30 miles from the point of measurement. The new device a method of continuous measurement of reservoir levels and could reduce spill-over water losses in cases where one reservoir is fed from others. The system permits long transmission of pressure up to 50,000 pounds psi.

If you desire further information on how this system operates, enter your name and address with the above key number on a Reader Service Card and mail to our Reader Service Dept.

Builders %Proportioneers% Omega Dedicate New Quarters

As part of its 130th Anniversary celebration, Builders Iron Foundry and its affiliated industries, Builders-Providence, %Proportioneers, Inc.%, and Omega Machine Co., held a dedication and open house on March 31, at their new quarters at 345 Harris Ave., Providence, R.I.



Installed in 1926, this unit, still in service, attests to the long-time performance of R-C Meters.

NO PENSION FOR THIS OLD-TIMER even after 23 years of service

Accurate and dependable as always, this 23-year-old Roots-Connersville Meter still performs faithfully. No retirement for this veteran! Because new demands called for higher capacity, it has been transferred to another job in the same plant. Its old duties have been taken on by a new R-C unit, purchased because of fine performance of this old-timer.

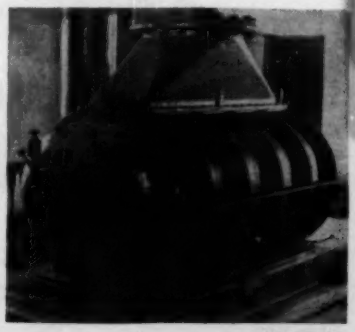
That's a common history of R-C Meters. They're built to measure accurately, and keep on doing it, year after year. Simple design, finely machined measuring surfaces and other important refinements account for their ability to measure gas accurately and unfailingly, almost indefinitely.

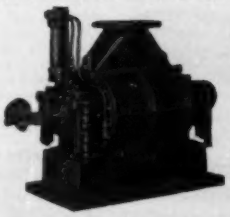
With 31 standard sizes and capacities from 4,000 to 1,000,000 cfh, R-C Meters meet the needs of most applications. Write for Bulletin 40-B-14 or tell us your specific requirements.

ROOTS-CONNERSVILLE BLOWER CORPORATION
506 Mount Avenue, Connersville, Indiana

(Right) This R-C Meter, with capacity of 317,000 cfh, replaced the "old-timer" above, now transferred to other duties.

(Below) Typical small capacity R-C Meter for low and medium pressures.





ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

The new offices place the administration, engineering, sales, and service departments adjacent to the manufacturing departments and increases

Mrs. H. S. Chafee, wife of the President cuts the ribbon at door of new building. Watching are Gov. John O. Pastore, Mr. Chafee, Pres., Mayor Dennis J. Roberts, and Earl Bradley, Exec. V.P. of the company.

the efficiency of operation and service to the customer. The new office building contains 26,000 sq. ft. of floor space, is completely air conditioned, sound proofed and fluorescent lighted. The foundry remains at its original location on Codding St.

In the dedication address, Henry Chafee, Pres., called attention to this move as another milestone in the history of the parent company which included, among others, the invention of the venturi tube in 1887 by Clemens Herschel and the venturi meter in 1891, as well as the unique Chronoflo Telemeter in 1931.

F. R. Paris Joins Marlow Pumps

Fred R. Paris, for 10 years with Worthington Pump and Machinery Corp., has been appointed District Representative for Marlow Pumps, Ridgewood, N.J. Working out of the firm's home office, Ridgewood, he will be in charge of municipal pump sales for New York State and part of Canada.

608

Recording Turbidimeter

General Electric Co., Schenectady, N. Y., has developed a new photoelectric instrument which provides a means for monitoring and controlling processes in water treatment plants or wherever turbidity is a signficant condition of the process. Called a "Recording Turbidimeter," it is compact in design, automatically gives continuous readings of turbidity, alerting the operator if certain predetermined limits are exceeded. The new device is expected to fulfill requirements of daily raw water and finished water turbidity reports which many state

health departments requires from water plants.

The recording element may be furnished calibrated on the silica scale, or uncalibrated for those who wish to calibrate their own instrument to agree with previous records. Two adjustments are provided for self-calibration: a zero scale set and a range setting. The instrument scale can be made to read any desired range of turbidity such as 0 to 10 ppm., 100 to 1,000 ppm., 90 to 100 ppm., etc.

To obtain further information on this Recording Turbidimeter, use a Reader Service Card on which is entered the above key number and your name and address.

10-SECOND SET-UP FOR CUTTING A-C PIPE ON-THE-JOB

A NEW SPRING LOAD Time-Saver Tool

GRAVITY-GRIP Vise

Holds any kind of pipe from 2" to 8" or 6" to 16" in a rigid Non-Slip grip

MADE TO USE WITH THESE SPRING LOAD TOOLS

Now you can do *all* pipe-cutting jobs on-the-job—save time, money, material! Gravity-Grip—the only vise *of its kind*—holds any length pipe, any material. Two models hold any size from 2" to 6" or 6" to 16". Set any place: truck, floor, ground—*it grips* and holds pipe at a convenient working height. Simple, compact, portable, easy to use. Sturdily made of heavy channel steel, fully guaranteed, very reasonably priced!

AC TENON TOOL
AC PIPE CUTTER

ORDER TODAY! Gravity-Grip on your next job will save its cost in time alone! Ask your jobber or write!

Distributed by
H. D. FOWLER CO.
P. O. Box 3004, Seattle 14, Wash.

2 MODELS
V6—2" to 6"
V16—6" to 16"

INTEGRITY Counts in PUMPS, too

This Truly Great AURORA TYPE O D CENTRIFUGAL PUMP

for general water supply, for municipalities, industrial establishments.

also for handling condenser circulating water, wash water, liquids in paper mills and distilleries, chemical solutions, oils in oil fields and refineries, irrigation, etc.

Type O D Aurora Horizontally Split Case, Double Suction, Single Stage Centrifugal Pump.

The ultimate in design and perfection—type O D pumps—in capacities to 4,000 G.P.M. and heads to 300 ft.—are accessible, compact and lasting. The horizontally split-case type of design permits removal of upper half of casing without disturbing suction or discharge. The impellers and water channels are streamline designed to minimize flow resistance and avoid turbulence, cavitation and consequent corrosion and erosion.

Write for CONDENSED CATALOG "M" and O D Bulletin 105

APCO TURBINE-TYPE PUMPS
For high pressure, Small capacity requirements (up to 150 G.P.M.). Wide operating range characteristics. No metal to metal contacts. Handles non-lubricating liquids without wear. Only one moving part—the impeller.

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS

AURORA PUMP COMPANY
40 Loucks St., AURORA, ILLINOIS

Hall Labs Celebrate Silver Anniversary

Hall Laboratories, Inc., Pittsburgh, Pa., celebrated their Silver Anniversary with a special anniversary dinner

in Pittsburgh. At this dinner, Dr. Hall was presented with a beautiful atmosphere clock by his associates. The celebration continued with another dinner two nights later at Vero Beach, Fla., and made it possible for J. M. Hopwood, founder and chairman of the board, and T. A. Peebles, board member, to participate and serve as hosts for the large Hagen-Hall-Calgon group.

609

Wafer Type Valve

R-S Products Corp., Philadelphia, Pa., has designed a wafer type valve to resist torque. Evolved from the known principle that face-to-face dimension does not reduce torque, a one-piece body casting valve has been developed that has many of the rugged features of the standard double flanged units.

When open, the beveled, streamlined vanes create a Venturi action. Pressure drop is low and there are no pockets to capture sediment, no change of flow direction to create turbulence thus reducing erosion and cavitation.

For further information regarding these valves, use a Reader Service Card after entering the above key number and your name and address.

Rensselaer Appoints Greenlees

Rensselaer Valve Co., Troy, N.Y., through Jack P. Orr, Southern Sales Manager, has announced the appointment of Jack Urban Greenlees as representative in the Southeastern territory. Mr. Greenlees is a graduate of Georgia Tech. and will make his headquarters with P. S. Avery at Rensselaer's Atlanta office, 254 Spring St., N.W.

Management Changes at Allis-Chalmers

Allis-Chalmers, Milwaukee, Wis., has announced several changes in district managers. R. D. Moody, formerly manager of San Francisco district, has been named manager of the Los Angeles district succeeding C. W. Schweers, who has been appointed manager of the company's New England region with headquarters in Boston.

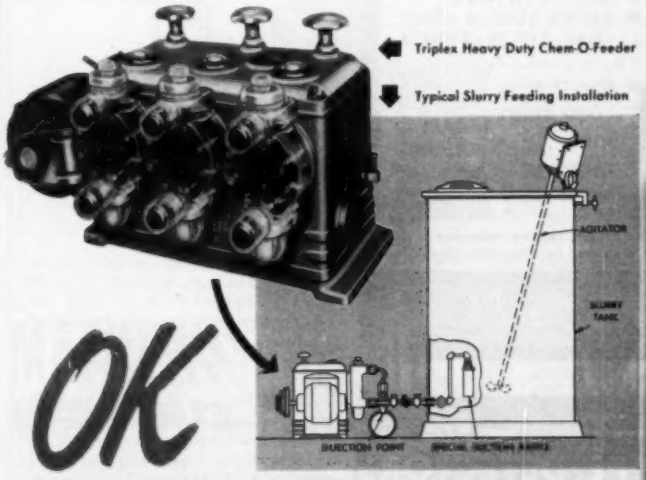
Moody is succeeded as San Francisco manager by James A. Longley, Jr., who has been a sales representative with that office since March 1946.

A graduate of the Colorado School of Mines, Moody was with the company's Knoxville and Chattanooga offices before transferring to San Francisco.

610

Sump Pump

Bryon-Jackson Co., Los Angeles, Calif., has designed a new **TL Sump Pump,** in both standard and special models to meet particular job require-



For FEEDING SLURRIES *Against Pressure!*

- LIME SLURRY FOR pH CORRECTION
- ACTIVATED CARBON SLURRY FOR TASTE AND ODOR CONTROL
- DIATOMACEOUS EARTH SLURRY FOR FILTRATION
- CALCIUM CARBONATE SLURRY FOR WATER CONDITIONING

% Proportioneers % new Heavy Duty Chem-O-Feeder solves a difficult feeding problem — it's ideal for feeding abrasive slurries against pressure — positively, accurately — without wearing out pump parts. For handling slurries the Chem-O-Feeder has semi-knife edge check valves of stainless steel or silver, with a diaphragm of whipcord-reinforced soft rubber.

The feeding rate can be adjusted with extreme accuracy by merely turning a knob, without stopping the Chem-O-Feeder. A magnifying register glass shows exact reading of stroke length in increments of .001". The plastic See-Thru reagent heads, convenient oil fill, and automatic lubrication reduce maintenance to a minimum. Chem-O-Feeders are available in Simplex, Duplex and Triplex Models to feed up to 8 g.p.h. per unit at pressures to 125 psi. Can be furnished with one or more slurry feeding heads, with other heads feeding different water treating chemicals. Write for information.

% PROPORTIONEERS, INC. %

350 HARRIS AVE. PROVIDENCE 1, R. I.

LEADITE

The Pioneer Self Caulking Material for C. I. Pipe

4 REASONS

why more miles of cast iron water mains are jointed with LEADITE than with any other melted self-caulking material:

- MELTS EASILY
- GOES FARTHER
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- MAKES A GOOD TIGHT JOINT THAT IMPROVES WITH AGE!

THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia 2, Pa.

No Caulking

Detectron 505
PIPE DETECTORS

FIRST WITH A METAL CASE
FIRST WITH SHIELDED LOOPS
FIRST WITH "SURE GRIP" HANDLE
FIRST WITH LIFETIME GUARANTEE

The new DETECTRON Model 505 locates, traces and confers pipes and cables with speed and accuracy. Small, compact, light-weight—with HEAVY DUTY PERFORMANCE.

- HIGHER QUALITY
- LONGER LIFE
- LOWER PRICE

TRIPLE VALUE!

For Complete Information Write for Folder 6-N

The Detectron Co.
5427 CAHUENGA BLVD. NORTH HOLLYWOOD, CALIF.

ments. This pump is a vertical centrifugal type suspended from a circular support plate by a standard pipe column. It is offered in 1½, 2, 2½,

3 and 4 inch models with capacities ranging from approximately 35 to 700 gpm. at heads of from 15 to 85 feet. The pumps are designed to handle solid-bearing liquids, the size of the solids being restricted to the strainer mesh opening of the pump.

Among the special construction features available at additional cost are: extra motor barrel column in 2, 4, and 6 ft. lengths; open impeller; float switch; explosion-proof or splash-proof motor; and special materials and special fittings.

To obtain further information on this new Sump Pump, use a Reader Service Card on which is entered the above key number and your name and address.

LITERATURE AND CATALOGS

611
ACTIVATED SILICA CHART

The Philadelphia Quartz Co. has available a chart for the **Preparation of Activated Silica Sol Coagulant** aids from 41° and 42° Baume silicates. The nomographic chart will be helpful to industries and water plants using coagulation with activated silica as an aid to coagulation.

Suitable for posting, the chart correlates flow rate and SiO_2 dosage to determine sodium silicate requirements, quantity of reacting material,

Orphans are Nice People

But "orphan" filtration equipment is a costly, aggravating nuisance. An obsolete valve, a control valve handle, or special operating table design are headaches to replace or duplicate when the "lore" is lost with time.

Roberts Filter is entering its second half century with an ever-growing family of installations having the same capable parents to care for their every need no matter how slight.

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

ROBERTS FILTER MANUFACTURING CO.
407 COLUMBIA AVE., DARBY, PA.

ROTO-TROL

RS-3
Sump Control
PRESSURE TYPE

Operates with equal success in wet wells containing either clear water or raw sewage. Used only for pumping out of a wet well.

No moving parts in the wet well. No floats to bind, no parts to lose their conductivity, nothing that will plug rapidly, due to building up of sludge. The standard *RS*-3 controls one to six pumps discharging from the same wet well. Voltages of 110 to 440, A.C. *RS*-3 can be mounted anywhere on wall or switchboard.

Write for performance and engineering data

Water Level Controls Division

HEALY-RUFF COMPANY
713 Hampden Ave., St. Paul 4, Minn.

dilution volumes, expected alkalinity of some preparations, and feed rate of silica sol for flow variations. Information is included on the following activating chemicals, sulfuric acid, ammonium sulfate, sodium bisulfate, sodium bicarbonate, carbon dioxide, and chlorine.

To obtain a copy of this useful nomograph, mail a Reader Service Card on which is entered the above key number and your name and address.

612

SEWAGE & WASTE TREATMENT

American Well Works, Aurora, Ill., has just published an attractively bound and illustrated manual on **Modern Processes and Equipment for Sewage and Industrial Waste Treatment.** This complete bulletin covers Activated Sludge Process, including Bio-Activation Jet Aeration and mechanical aeration, Screening, Grit Removal, Pre-Treatment, Sedimentation, Trickling Filters, Sewage and Sludge Pumping, Industrial Waste Treatment and Recovery, Treatment Processes and Installation views. The bulletin covers discussions of various types of equipment and methods used in treating sewage and industrial wastes. Profusely illustrated with photographs of equipment and installations it also contains phantom-eye diagrams and complete flow charts of treatment processes.

To obtain a copy of this informative manual, use a Reader Service Card on which is entered the above key number and your name and address.

613

FLUID-MOTOR OPERATED GATE VALVES

Crane Co., Chicago 5, Ill., has issued a four page bulletin on its new **Fluid-Motor Operated Gate Valve.** The bulletin describes how these valves may be operated by compressed air, water, or oil. The bulletin explains how the fluid-motor works, and tells the sizes and types of valves which can be obtained in this new design.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered your name and address together with the above key number.

614

VACUUM DEWATERING

Eimco Corp., Salt Lake City, Utah, has published a bulletin describing the advantages of **Vacuum Dewatering of Sewage Sludge.** Illustrated

SPEED OF REPLACEMENT MEANS SAFETY FOR THE COMMUNITY

When a hydrant is broken in a traffic accident, it is a matter of community concern to get it back in operating condition promptly. The Mathews Modernized Hydrant can be restored in a matter of minutes! Two men can do the job, in a jiffy and *without excavating*, just as soon as they can get to the scene of the accident with a spare barrel and a lug wrench.

MATHEWS HYDRANTS

Made by R. D. Wood Company

Public Ledger Building, Independence Square

Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves.

Mathews Modernized Hydrants Set the Pace: Easily maintained because simple in construction • All working parts contained in the replaceable barrel • Stuffing box cast integral with nozzle section • Head can be turned 360° • Replaceable head • Nozzle sections easily changed • Nozzle levels raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for extra strength, toughness, elasticity • Operating thread only part to be lubricated • A modern barrel makes an old Mathews good as new

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SERVICING
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A Filter Medium For All Purposes

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Anthracite Institute Building
Wilkes-Barre, Pa.

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PALMER FILTER EQUIPMENT CO.

822 E. 8th St. Erie, Pa.

Engineers and Sales Agents

CONTROL
Gas Pressures

From Digestion Tanks with NORWALK REGULATORS and CHECK VALVES

Handling sewage gas from digestion tanks is one of Norwalk Valve's activities in the manufacture of gas pressure control equipment. Stock items include check valves, pressure relief valves, regulators, all sizes and pressures. Illustrated are the Norwalk Disc Check Valve and the "Meter Cop" (a Norwalk exclusive).

DESIGN AND FABRICATION OF SPECIAL UNITS

Any unusual problems can be solved by our design and fabrication of special units. Norwalk products are made with ASTM and other materials required by contract specifications.

Outline your requirements in a note to us. We'll be glad to suggest designs and special equipment. We'll also send along a catalogue of our complete line of gas control equipment.

NORWALK VALVE COMPANY

33 RAILROAD AVENUE
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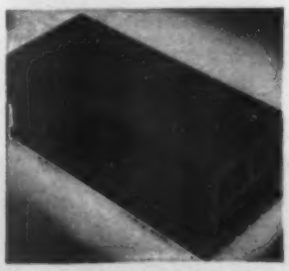
Leopold

GLAZED FIRE CLAY TILE FILTER BOTTOM



• Permanent • Non-corrosive • Economical • Impervious to acid or alkali solution • Practically non-absorbent • Equal distribution.

Complete water purification and sewage plant equipment.

Write today for complete information

F. B. LEOPOLD CO., INC.
2413 W. CARSON ST. PITTSBURGH 4, PA.

with photos of actual Eimco installations the bulletin explains in detail how the system works, construction of the equipment and the results obtained by municipalities who use this system.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

615

%PROPORTIONEERS% BULLETIN CATALOG

%Proportioneers, Inc.%, of Providence, R.I., has just issued a new **Bulletin Catalog.** This bulletin lists, with a picture of the front cover, all of the General Bulletins, Standard Method Brochures, Reprints, and Instruction Books published by %Proportioneers, Inc.%. Included in the Catalog is a self-addressed, stamped post card for convenience in ordering any of the material discussed.

To obtain a copy of this Bulletin Catalog, use a Reader Service Card on which is entered the above key number and your name and address.

616

AUTOMATIC SCREEN CLEANING

Foxboro Co., Foxboro, Mass., has just issued a new **Applications Engineering Data Sheet** covering control of cleaning cycles for traveling screens. Included in this sheet are a schematic installation drawing and typical wiring diagram.

The system, already in use in a large number of prominent power plants, steel mills, and other large water users depends upon the measurement of hydraulic loss across the trash rack and traveling screen.

It initiates automatic cleaning for a regular cleaning cycle, and, if for any reason the cleaning fails to reduce the loss across the screen, emergency alarms are provided to warn operators of unusual operating conditions.

To obtain a copy of this Application Engineering Data Sheet, use a Reader Service Card on which is entered the above key number and your name and address.

617

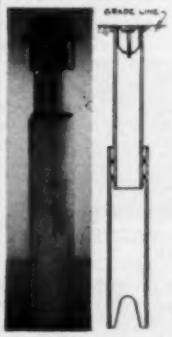
HAYS CONTACT AERATION

Refinite Sales Co., Omaha, Neb., has issued a pamphlet on **Refinite-Hays Contact Aeration Sewage Treatment.** The pamphlet is divided into three sections covering contact aeration principle, special message of engineering significance, description of process, outstanding feature

M-SCOPE Pipe Finder
LIGHTWEIGHT MODEL

Catalog
No. 25M
On Request

JOSEPH G. POLLARD CO., INC.
Pipe Line Equipment
New Hyde Park **New York**



New Shock-Proof Curb Service and Valve Boxes

NEW FEATURE—the SHOCK-PROOF JOINT permits easy, accurate, hand-adjustment. Absorbs surface and road shocks. Asbestos cement pipe with cast iron top and cover. Lightweight, easily installed, corrosion proof. Available in range of standard sizes and styles. Write for detailed information.

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WATERWORKS AND SEWERAGE SUPPLIES
Local Agents for Mott Valve & Fittings Co. . . . James Jones Co. . . . Smith Blair, Inc. . . . American Brass Co. . . . Kennish Foundry . . . Johns Manville, House Connection Pipe.

and advantages, principal applications, simplicity of operation and maintenance, results of a typical installation, and typical installation and reference. This very complete pamphlet also discussed how to determine required plant size, advantages of prefabricated plants and special plants. The bulletin is well illustrated and shows completed installations now in operation in addition to blue print type diagrams of typical plants and piping arrangements.

To obtain a copy of this informative pamphlet, use a Reader Service Card on which is entered the above key number and your name and address.

618

PUMPING SOLIDS

Barrett, Haentjens & Co., Pittsburgh, Pa., has just issued a bulletin entitled **"Pumping Solids."** An interesting part is the diagrams for determination of the required pump capacity, pipe size, average velocity, friction loss, specific gravity, pump horsepower, etc., for which complicated calculations are frequently necessary. These calculations now can readily be made, without using a slide rule, by means of the diagrams included in this bulletin.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

619

ROTARY VACUUM FILTER

Oliver United Filters, Inc., New York, N.Y., has just released a four page bulletin on **Oliver Sewage Sludge Dewaterer.** The bulletin describes the outstanding advantages of the Oliver rotary vacuum filter and shows several photographs of installations of these units as well as flow diagrams of installations in different types of sewage treatment plants.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

620

GROUND-KEY STOPS

Glauber Brass, Inc., Kinsman, Ohio, has just published a new catalog covering their line of **Ground-Key Waterworks Stops.** This catalog amply illustrated with photographs of the stops covers Ground Key Stops and Drains, Hydrant Stops and Drains, Ground Key Curb Stops, Corporation Stops, Lead Goosenecks, Corporation Stop Coup-

"Here's why we're saving money on shop costs, Jim--it's the simplicity of our AMERICAN Meters"
Repair costs are reduced when you install Buffalo-made Meters in your system. Simply designed and constructed, AMERICAN Meters can be quickly taken apart and re-assembled. Fewer moving parts to require servicing — minimum replacement cost.
AMERICAN (Bronze Case) WATER METERS
NIAGARA (Galv. Iron Case) WATER METERS
BUFFALO METER CO.
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DARLEY MAGNETIC DIPPING NEEDLE $17.50
with 3 section telescoping handle $22.25
Write Today for 48-Page Catalog
W. S. DARLEY & CO., Chicago 12

Since 1886

"Ebony Paint Kills Rust"

A Refined Coal Tar Base Paint

No matter how old the job—5 to 25 years—rust has never been found under EBONY PAINT.

Specified by many Engineers for Sewage Disposal and Water Plants.

Quart sample and literature on request.

Ebony Paint Manufacturing Co.
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40 FOOT PRE-STRESSED "GUNITE" TANK BY CEMENT GUN CO.

The picture shows a partially completed 40' diameter, 110,000 gallon pre-stressed "GUNITE" tank with a "GUNITE" dome roof, designed and built by us.

When this photo was made the tank was filled with water for leakage test. After the test showed the tank to be bottle-tight, two inch mesh reinforced "GUNITE" was placed over the outside to permanently protect the pre-stressed hoop rods. The tank was subsequently covered with 12" of fill over the dome.

At the present time, our organization is constructing several Pre-Stressed Tanks, without dome roofs, for use as digester tanks in sewage disposal works.

Many examples of Cement Gun Company's repair, remodeling and new construction work with "GUNITE" are pictured and described in Bulletin C2400. A request on your letterhead will bring your free copy by return mail.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.
MANUFACTURERS OF THE CEMENT GUN

—M-SCOPE—
PIPE LOCATOR

TYPE AB—1950 MODEL

- Metal Cased Cabinets
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AIR RELEASE VALVES
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VALVE & PRIMER CORP.
127 N. DEARBORN ST.
CHICAGO 2, ILL.

lings, Lead Flange Corporation Stops, Lead Flange Couplings, Brass Main Plugs, Couplings for Copper Service Pipe and Corporation Stop Adapters. All equipment is labeled with the Glauber stock and order number plus notations various on the stock sizes available.

To obtain a copy of this catalog, use a Reader Service Card on which is entered the above key number and your name and address.

621
WATER TAPPING MACHINE

Hays Mfg. Co., Erie, Pa., has just issued a folder entitled **Water Tapping Machine Model "B."** This folder gives complete and detailed instructions for operation of the tapping machine including instructions on changing of taps and screw plugs, placing corporation stop and screws plug in machine, placing combined drill and tap in tap holder, mounting of machine on the main, drilling and tapping, inserting corporating stop and removing machine from the main. Also included are diagrams showing all parts of the machine with numbered parts guide and photos of taps, saddles and screw plugs.

To obtain a copy of this folder, use a Reader Service Card on which is entered the above key number and your name and address.

622
SELF-LUBRICATING PACKING

Greene, Tweed & Co., North Wales, Penna., has issued a 4-page bulletin on **Palmetto Self-Lubricating Packings.** The text covers the principles of self-lubrication packing design, structure and performance as well as analysis of each individual packing from the standpoint of application to specific services. Illustrations and specifications of packings are included.

To obtain a copy of this bulletin on self-lubricating packing, mail a Reader Service Card. Be sure to enter the above key number and your name and address on the card.

623
FLOW MEASUREMENT

Fischer & Porter Co., Hatboro, Pa., have just published a new catalog on **"Plant-Wide Flow Measurement."** Described in this catalog are three basic units in standard pipe tees plus indicating, controlling, recording or telemetering instruments. The catalog shows that flow rates from 2 to 6200 gpm. and from 3 to 12,500 cfm. are handled with a minimum number of basic metering parts

FREE

to WATER WORKS and SEWAGE MEN

HOW TO CONTROL ALGAE

"The Use of Copper Sulphate in Control of Microscopic Organisms" by Dr. Frank E. Hale (former Director of Laboratories, Dept. of Water Supply, City of New York) is an authoritative work concerning the control of micro-organisms and elimination of tastes and odors. Describes in detail methods of controlling various forms of microscopic life commonly encountered in water supply systems. Contains descriptive material, plus 48 photo-micrograph studies of organisms discussed.

ROOT AND FUNGUS CONTROL

"Copper Sulphate for Root and Fungus Control in Sanitary Sewers and Storm Drains," by John W. Hood, contains information published for the first time. This material includes actual methods for control and operating procedure. Here's the book that is a "must" for all sewage men.

GET EITHER OR BOTH OF THESE BOOKLETS ABSOLUTELY FREE— These two valuable booklets, so important to all water works and sewage men, are yours *without obligation.* Mail coupon below!

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Please send my free copy of (check one or both):

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W8-650

designed for installation inside standard pipe fittings. Amply illustrated with diagrams and photographs that show the Ratosleeve meters are suitable for liquids, gases, pulps and slurries and permit plant-wide flow-measurement standardization at low cost.

To obtain a copy of this catalog, use a Reader Service Card on which is entered the above key number and your name and address.

624
TOTAL HARDNESS TEST

Allis-Chalmers, Milwaukee, Wis., has available new literature describing how they employ the **"S. & B." Method for Determining Water Hardness.** The new method, considered far superior to the inaccurate soap method and the much slower gravimetric determinations, has been in use in the Allis-Chalmers water conditioning service for more than a year.

The literature explains that the precision and range of adaptability extends from softened waters with less than 1 ppm. of total hardness to those having concentrations comparable to sea water. Other than filtration, no manipulation of the sample is required prior to titrating.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

625
CENTRIFUGAL PUMPS

Worthington Pump & Machinery Corp., Harrison, N.J., has issued a bulletin on their two stage, double suction **Centrifugal Pumps,** type UZD. The bulletin explains by a series of mechanical drawings the salient features of this series of pumps. In graph form on the back page is a selection chart, showing the various capacities of the three models illustrated, for quick selection of the proper pump. Dimensions of the pumps is conveniently set-up in chart form as well as information on the drilling of flanges for both discharge and suction.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

626
CIRCULAR COLLECTORS

Ralph B. Carter Co., Hackensack, N.J., has just issued a newly revised 16 page bulletin on the three different types of **Circular Collectors** for clarification (sedimentation) and

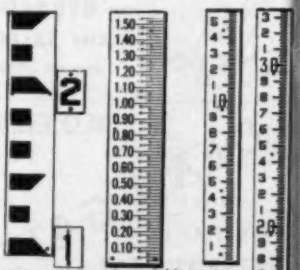
ENGINEER'S FILE ON HYDROGRAPHIC INSTRUMENTS

STEVENS
HYDROGRAPHIC INSTRUMENTS

A wide range of precision measuring instruments to record and indicate head, flow, and totalize flow; for waterworks, sewerage, irrigation and industrial uses. New, low cost methods of liquid level recording.

These methods and instruments for all liquid measuring problems are listed in a complete Engineer's Data folder for your convenience. This information folder is *FREE* and can be had by filling in the coupon below. The folder includes data on instruments to record fluctuations of liquids in oil production, stream gaging, deep wells, sewage, irrigation, etc., both accurately and economically.

STAFF GAGES



An inexpensive, dependable means of measuring liquid levels. They are designed so as not to affect the flow of liquid. Porcelain enameled for easier reading . . . accurately graduated in English or metric system . . . will not rust or discolor. Staff gages are available in a wide range of lengths and widths — Staff gages for as little as $1.00. Complete information in the Engineer's Data Folder.

Leupold and Stevens pioneered the field of water level recording 43 years ago, and since then have developed precision measuring instruments of all types and descriptions to meet many specific needs.

Write for the complete file. There may be a measuring device that exactly suits your specific requirements. Use the coupon below.

Please send me the *Engineer's Data Folder* with complete information on Hydrographic instruments.

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SEWAGE TREATMENT
AND THE
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PROVED • SIMPLE • ECONOMICAL

This interesting and useful booklet is available free upon request.

INFORMATIVE!

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120 Broadway, New York 5, N.Y.

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DEPENDABLE JOINTING COMPOUND
Seals Bell and Spigot Water Mains
Economical—Effective
Over 35 Years Of Dependable Performance

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FOR GATES TO 60 IN.
★ ★ ★ ★
PORTABLE FOUR WHEEL TYPE
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FOR SMALL GATES IT'S THE
POWERENCH
GAS ENGINE DRIVE
PORTABLE, WEIGHS 37 LBS.
DEAN GATE OPERATORS
PAYNE DEAN & CO. MADISON, CONN.

ZECO GREENSAND ZEOLITE
ZECO and HI-ZECO Greensand Zeolite for water softening, filtration and iron removal. ZECO Manganese Zeolite for iron and manganese removal. COREXITE mineral for corrosion control and water stabilization.
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Sales Office 30 Cedar St. New York N.Y. Factory Medford N.J.
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STOP WATER SEEPAGE SEWAGE CORROSION
WITH FORMULA No. 640
a clear liquid penetrating (1"+) sealer for concrete and masonry preventing water absorption and reducing the action of acids. Holds 12' hydrostatic head. Use our Hayproc Rubberized Enamel for color on walls and floors—not affected by concentrated acids, alcohol, oil, or traffic abrasion.
30 OTHER PRODUCTS
Write for technical data.
Haynes Products Co., Omaha 3, Nebr.
See our file in Sweet's

sludge collection—used in sewage treatment, industrial waste treatment or water purification. This bulletin gives complete engineering data and specifications plus comprehensive capacity tables. Complete with detailed diagrams covering three Carter types of circular collectors, one page is devoted exclusively to latest data on the Carter Plunger Sludge Pumps. Latest information has been included on the new Crosshead Guide design, available for all Carter Sludge Pumps.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

627
CONDENSATION DRIP CONTROL

J. W. Mortell Co., Kankakee, Ill., has issued an **Industrial NoDrip Handbook** covering the use and application of NoDrip, their product for condensation drip and corrosion control. The handbook shows how NoDrip stops condensation drip from cold water pipes, cold water storage tanks, water softeners, condensers, crystalizers, air ducts, wood and plaster surfaces, etc. Amply illustrated it shows methods of applying NoDrip on different types of surfaces and contains charts and graphs on relative humidity and how to estimate quantity needed for type of application.

To obtain a copy of this handbook, use a Reader Service Card on which is entered the above key number and your name and address.

628
DIFFERENTIAL PRESSURE TRANSFORMER

Hagan Corp., Pittsburgh, Pa., has just issued a 4 page bulletin on their **Differential Pressure Transformer.** In a cut-away view of the transformer, the use of color enables the reader to trace the flow or area within the transformer of both the low and high fluid pressure as well as the air supply and modulated air pressure. Complete explanation of all parts of the transformer plus operating characteristics such as metering range, pressure differential measuring range and response are also contained in the bulletin.

The back page shows the outline dimensions of the transformer by means of a mechanical drawing.

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629

HYDRO-LINE PUMP

Peerless Pump Division, of Food Machinery and Chemical Corp., Los Angeles, Calif., have just issued a pamphlet on **The Peerless Hydro-Line Pump.** The pamphlet contains a complete description of this vertical centrifugal multi-stage close-coupled process pump that is especially suited for applications where net positive suction head is limited and where space is at a premium. Adequately illustrated by schematic drawings with key number explanations it explains the characteristics, how it is installed, how to maintain the pump and charts on typical dimensions.

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630

ANTI-RUST PAINT

Speco, Inc., Cleveland, Ohio, announces issuance of a new application bulletin on **Rustrem,** anti-rust paint.

The bulletin describes the product's reputed "100 plus one uses" in industry, farms, cars and homes. According to the manufacturer, Rustrem can be applied right over rust without wire brushing or scraping. It penetrates and seals the surface, effectively preventing further rust action.

Rustrem, resistant to temperature changes, moisture, industrial chemicals and gases is now available in clear, colorless form in addition to black and super aluminum. Rustrem clear used as a primer or base coating can be painted over with any quality paint (except lacquer).

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631

HYDRAULIC DIGGER

Badger Machine Co., Winona, Minn., has just released a bulletin on their **"Hopto Digger."** The bulletin describes methods of attaching this hydraulically operated power take off digger to tractor, jeep or truck, and types of buckets available. Complete specifications regarding dimensions, construction of digger, capacity, degree of swing and depth of cut are also contained in this illustrated bulletin.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

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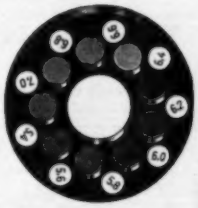

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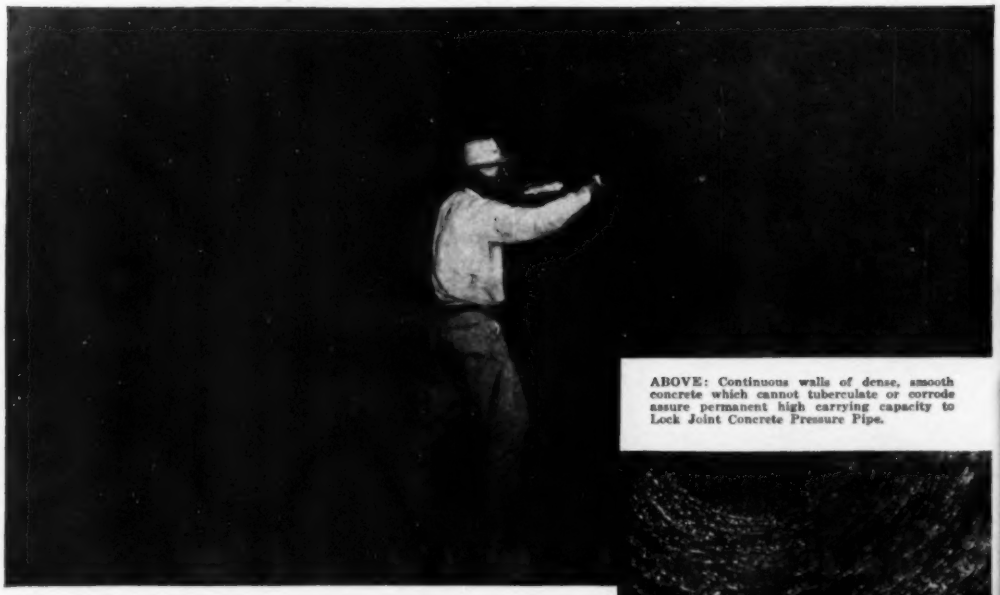

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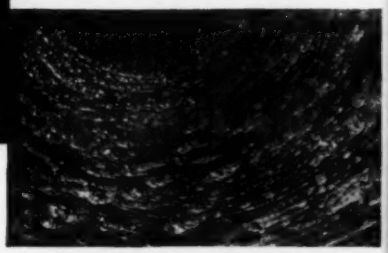

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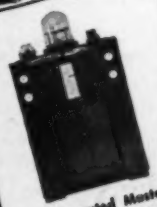

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